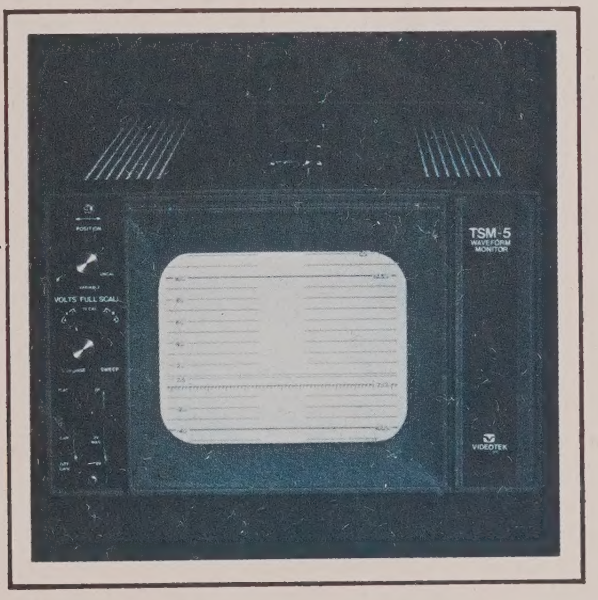
TSM-5

Video Waveform Monitor

INSTRUCTION & SERVICE MANUAL



VIDEOTEK INC

QUALITY ENDURES

Warranty

Videotek, Inc. warrants its products to be free of defective components and workmanship for a period of one year from date of purchase. No charge will be made for parts or labor, provided the equipment is insured and returned to Videotek. Equipment must be shipped in original packing or equal. Warranty is void if equipment has been altered or becomes defective due to abuse.

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General Information

The TSM-5 is a video waveform monitor which provides bright, sharp, easy-to-observe video waveform displays on a five inch CRT.

Features

COMPACT	Mounts in 5¼ inches of vertical rack space and one-half 19 inches of rack width space.
NTSC	Standard NTSC 525 lines, 30 frame (60Hz field rate) scan.
PAL	Standard PAL 625 lines, 25 frame (50Hz field rate) scan.
INPUTS	Selectable A/B video looping BNC inputs, AC or DC coupled.
OUTPUT	Separately buffered video out 1VP-P into 75 ohm termination.
SYNC	Selectable internal/external input.
FILTERS	FLAT, IRE, CHROMA, or DIFFERENTIAL GAIN.
TIME BASE	2 line, expanded 2 line, 2 field or expanded 2 field.
YRGB/RGB	9 pin access connector for monitoring color processing amplifier waveforms.
DC RESTORATION	Selectable
HIGH VOLTAGE REGULATION	
100% SOLID STATE CIRCUITRY	

Electrical Characteristics

The following performance requirements apply over an ambient temperature range of 0°C to +50°C. The rated accuracies are valid when the instrument is calibrated at +20°C to +30°C, after a warm-up time of three minutes. A twenty minute warm-up is required for rated accuracies at 0°C ambient temperature.

TSM-5 Specifications

VERTICAL DEFLECTION SYSTEM:

FLAT: Bandwidth from 25Hz to 3.6MHz ± 1% of 50kHz response. 3.6MHz to 5MHz + 1%, − 3% of 50kHz response.

IRE: Response per 1958 IRE STD 23 S-1. Attenuation at 4.43MHz, 22dB or greater.

CHROMA: Response at 3.58MHz does not vary between FLAT and CHROMA by more than 1%. 7.2MHz attenuation is 25dB or greater.

DIFFERENTIAL GAIN: CHROMA display x 5.

TRANSIENT RESPONSE: Less than 1 IRE unit of preshoot at 1V full scale, FLAT using $\sin^2$ pulse bar signal.

PULSE TO BAR RATIO: 0.99:1 to 1.01:1

OVERSHOOT: 2 IRE units or less.

RINGING: 2 IRE units or less.

TILT WITH FIELD RATE SQUARE WAVE OR VERTICAL WINDOW OR 25 us PULSE SIGNAL APPLIED: 1% or less.

TILT WITH BASELINE AT 50 IRE AND SIGNAL ADJUSTED TO 100 IRE: Displayed differential gain tilt of 1% or less, 20-90% APL change.

DEFLECTION FACTOR 1V FULL SCALE: 140 IRE units ± 1% 1V input.

DEFLECTION FACTOR 4V FULL SCALE: 140 IRE units ± 3% with 4V input.

MAXIMUM INPUT LEVEL AC COUPLED 1V/4V FULL SCALE: ± 5VDC

MAXIMUM AMPLITUDE FLAT / IRE: 200 IRE units maximum.

CHROMA: 20 IRE of burst frequency in 1V cal may be expanded to 30 IRE for differential gain measurements at 10-90% APL levels.

DIFFERENTIAL GAIN: 20 IRE of subcarrier may be expanded to 100 IRE units for measurement of differential gain with 10-90% APL levels.

INPUT IMPEDANCE (UN-TERMINATED) 1V/4V FULL SCALE: 100k @ 30 pf

MAXIMUM RETURN LOSS INPUTS A/B TERMINATED IN 75 OHM: 40dB to 5MHz.

VARIABLE 1V FULL SCALE: Adjustable to 140 IRE with 0.25 to 1.0V input.

VARIABLE 4V FULL SCALE: Adjustable to 140 IRE with 1.0 to 4.0V input.

VIDEO OUTPUT: Bandwidth 25Hz to 5MHz ± 3%. Differential gain @ 50% APL with 140 IRE units displayed is ± 2%. Differential phase @ 50% APL with 140 units displayed is ± 3%. DC level on output is 1V or less into 75 ohm. Nominal output impedance is 75 ohm. Output signal amplitude at 1V cal input is 1V ± 10% for 140 IRE unit display. At 4V cal input with 4V sync input, output is 1V ± 10% for 140 IRE display.

HORIZONTAL DEFLECTION SYSTEM

TIME BASE LINE: Always displayed with no sync or video inputs.

2V TIME BASE: Equal to the frame rate of applied video or external sync. Syncronized length is 12.1 Div ± 0.5 Div.

2V MAGNIFICATION TIME BASE: Approximately 20 times 2V.

2H TIME BASE: ½ line rate of applied video or sync.

1 us / DIVISION TIME BASE: 1 us / Div ± 3% excluding first and last major division.

LINEARITY: 3% or less over complete horizontal position range excluding first and last major division.

RGB / YRGB CIRCUITS

(Factory connected for RGB)

STAIRCASE AMPLITUDE YRGB / RGB: 4 or 3 step, 10V ± 15% for 9 division displacement.

MAXIMUM STAIRCASE INPUT: Not to exceed ± 12VDC limits. Maximum AC input is +12VP-P.

TIME BASE IN RGB / YRGB: 2V position is equal to the field rate of the applied video or sync. 2H position is equal to the line rate of the applied video or sync.

TIME BASE IN RGB (3 STEP): 27% to 33% of normal sweep, 2V or 2H.

YRGB (4 STEP): 20% to 25% of normal sweep, 2V or 2H.

TRANSIENT RESPONSE OF STAIRCASE: Field rate or line rate commutation of input.

CONTROL SIGNAL: External (12-15V between pins 4[+] and 5[−]). Internal (jumper pin 5 to 6, ground pin 4 of 9 pin connector).

CONTROL CIRCUIT INTERNAL INPEDANCE: 680 ohms ± 10%.

DC RESTORATION

RESTORER TIME: Back porch.

LOW FREQUENCY RESPONSE AT 60 Hz: Attenuation of 60Hz added to input signal is 5% or less, DC restoration switch set from OFF to ON.

BLANKING LEVEL SHIFT DUT TO PRESENCE OR ABSENCE OF BURST: 1 IRE or less.

BLANKING LEVEL SHIFT WITH 10-90% APL CHANGE: APL changes from 50% to either 10% or 90% will cause blanking shift of 1 IRE unit or less.

CALIBRATOR

FREQUENCY: At least 2 cycles will be displayed in 2H. Must synchronize 2H sweep.

AMPLITUDE: 1.0V ± 1%.

EXTERNAL SYNC

INPUT SIGNAL REQUIREMENT: 1.5 to 4.5VP-P composite sync will synchronize sweeps.

UNTERMINATED INPUT IMPEDANCE: Approximately 15k.

MAXIMUM INPUT VOLTAGE: 20VP-P

POWER REQUIREMENTS

SOURCE: 110VAC/220VAC 48Hz to 440Hz selectable by back panel switch

110VAC:
Low: 90-110VAC
Med: 99-121VAC
High: 108-132VAC

220VAC:
Low: 180-220VAC
Med: 198-242VAC
High: 216-246VAC

Voltage taps selectable by internal jumper.

CONSUMPTION: 60wt typical, 66wt peak @ 110VAC or 220VAC.

PHYSICAL

PHYSICAL CHARAC.: Gray wrinkle finish aluminum front panel. Aluminum chassis.

PHYSICAL DIMENSIONS: 5¼" (13.3cm) H x 8½" (21.6cm) W x 18½" (47.0cm) D.

ENVIRONMENTAL

OPERATING TEMPERATURE: 0°C to 50°C

STORAGE TEMP.: − 40°C to 65°C

TRANS.: 24" impact drop, properly boxed.

ACCESSORIES

STANDARD ACCESSORIES: 9 pin plug, 9 pin cover, manual and standard case, 75 ohm precision terminator.

OPTIONS

PAL: 625 line / 50Hz 4.43MHz, PAL graticule.

Portable Case
Without Case
Double Rackmount Case with slides
Blank Plate for Left or Right Side or Dual Case

RGB / YRGB: YRGB modification.

Operating Instructions, Panels, Controls and Connections

Operating Instructions

Power Requirements

The regulated power supplies in the TSM-5 will operate with line voltages from 90 volts AC to 132 volts AC when the line volts switch is set to the 110V position, and from 180 volts AC to 264 volts AC when the line volts switch is set to the 220V position.

Both voltage positions are controlled by an internal tap select. Three voltage taps are available to cover the ranges listed above.

Cooling

The TSM-5 is cooled by convection air flow through the instrument. For information concerning minimum clearance needed around the instrument for proper air circulation, refer to the dimension drawing on page 9-3.

Installing the TSM-5

The TSM-5 is designed to be cradle-mounted in a standard 19″ rack or console side by side with another TSM-5. If only one TSM-5 is mounted on the rack adapter, a blank panel assembly that covers half of the rack can be obtained.

When planning a custom installation that does not require the use of a Videotek rack adapter and panel assembly, use the dimension drawing as a reference for determining the mounting dimensions.

FRONT PANEL (LEFT SIDE)

OSITION ZONTAL) CONTROL A ten turn control to position the display horizontally.

CAL AND UNCAL INDICATORS Indicate when the VARIABLE (VOLTS FULL SCALE) control is set to the calibrated (CAL green light) or uncalibrated (UNCAL red light) position. The indicators also function as a pilot light to indicate when the instrument is on.

VOLTS FULL SCALE SWITCH Five position switch selects the full scale vertical deflection factors for Video Input A, Video Input B, or the internal 1V CAL (1 volt) calibrator signal.

VARIABLE (VOLTS FULL SCALE) CONTROL Continuously variable control with a minimum range of 1 to 4 to permit variable adjustment of gain for each VOLTS FULL SCALE switch position. Used in conjunction with the VOLTS FULL SCALE switch to accommodate input signals from 0.25 volt to 4 volts.

RESPONSE SWITCH Four position switch selects FLAT, IRE, or CHROMA frequency response characteristics.

A fourth position, DIFF GAIN, provides the same frequency response as the CHROMA position but with an additional gain of 3X to 5.5X.

SWEEP SWITCH Four position switch selects 2H, 1us/DIV, 2V MAG and 2V sweep rates.

2H: Sweep repetition is half line rate to display two television lines.

1 us/DIV: Expands the two-line display to provide 10X magnification of the horizontal blanking interval or any other portion of the two-line display.

2V MAG: Expands the two-field display to provide 20X magnification of the vertical blanking interval or any other portion of the two-field display.

2V: Sweep repetition is half field rate to display two fields (one frame).

FRONT PANEL (RIGHT SIDE)

INTENSITY CONTROL Controls brightness of the display.

POWER-SCALE ILLUMINATION CONTROL POWER switch turns instrument on or off. SCALE ILLUM control sets light level of graticule markings.

FOCUS CONTROL Permits adjustment of CRT beam for optimum definition.

POSITION (VERTICAL) CONTROL Vertically positions the display.

SYNC SWITCH Two position slide switch to select INT or EXT sync.

DC RESTORER SWITCH Two position slide switch to turn the DC restorer ON or OFF.

REAR PANEL CONTROLS AND CONNECTORS (LEFT SIDE, FIG. 2)

ASTIGMATISM ADJUSTMENT Screwdriver adjustment permits adjustment of the CRT beam for optimum definition when used in conjunction with the FOCUS control.

TRACE ALIGN ADJUSTMENT Screwdriver adjustment to align the trace or the display with the horizontal graticule lines.

LINE VOLTS SWITCH Two position slide switch for selecting a line voltage of 110 volts or 220 volts.

POWER FUSE MDL 1 AMP for 110 volt range. MDL ¾ AMP for 220 volt range.

REAR PANEL CONTROLS AND CONNECTORS (RIGHT SIDE)

EXT SYNC CONNECTORS BNC connectors for accepting external sync signals. The inputs are loop-through and compensated for 75 ohms.

VIDEO INPUT A CONNECTORS BNC connectors for applying an external video signal to VIDEO INPUT A. The inputs are loop-through and compensated for 75 ohms.

VIDEO INPUT B CONNECTORS BNC connectors for applying an external video signal to VIDEO INPUT B. The inputs are loop-through and compensated for 75 ohms.

VIDEO OUT CONNECTOR BNC connectors for monitoring the displayed signal on a picture monitor.

RGB/YRGB CONNECTOR Nine-pin socket for accepting external staircase and relay control signals.

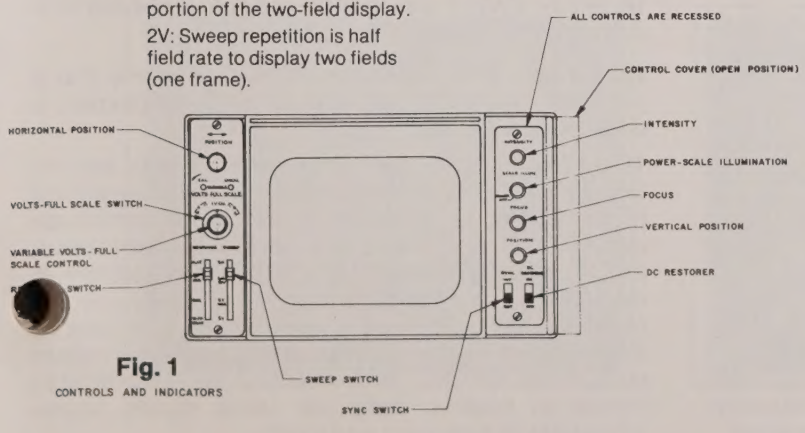


Fig. 1
CONTROLS AND INDICATORS

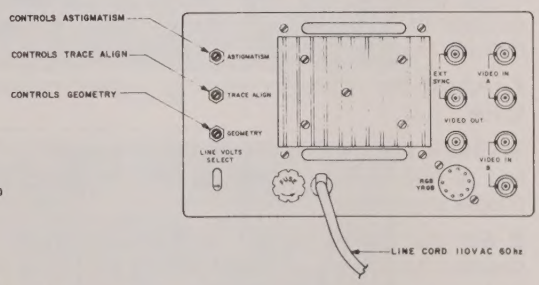


Fig. 2
INPUTS, OUTPUTS AND CONTROLS

The following procedure is suggested as a way of becoming familiar with the operation of the TSM-5. A 1-volt modulated staircase signal is used in this procedure to illustrate the displays.

1. Set the INTENSITY control fully counterclockwise.

2. Check that the LINE VOLTS switch and internal tap (P907) are set to the proper line voltage operating range.

3. Connect the instrument to a suitable power source and turn on the POWER-SCALE ILLUM control.

4. While the instrument is warming up (at least 3 minutes), set the TSM-5 front panel controls as follows:

Left Front Panel Controls:	
POSITION (Horizontal)	As is (10 turn control)
VOLTS FULL SCALE	A-1 volt
VARIABLE (Volts Full Scale)	CAL
RESPONSE	FLAT
SWEEP	2H
Recessed Front Panel Controls (Right Side):	
POWER-SCALE ILLUM	Desired graticule illumination
FOCUS	As is
POSITION (Vertical)	Midrange
SYNC	INT
DC RESTORER	ON
Rear Panel Controls:	
ASTIGMATISM	As is
TRACE ALIGN	As is

5. Rotate the INTENSITY control clockwise until the trace is at the desired brightness.

6. Use the Vertical POSITION control on the trace to the 0 IRE graticule line. Use the Horizontal POSITION to position the start (left end) of the trace to the first major division mark on the 0 IRE graticule line.

7. Adjust the FOCUS control to obtain a well-defined trace.

8. Check that the trace aligns with the 0 IRE graticule line. If not, adjust the TRACE ALIGN control to obtain proper alignment.

9. Set the VOLTS FULL SCALE switch to the 1V CAL position. Use the Vertical POSITION control to vertically center the display in the −40 to 100 IRE unit area of the graticule. Adjust the ASTIGMATISM and FOCUS controls to obtain a well-defined waveform. The calibrator waveform should be 140 IRE units (within 1.4 units) in amplitude (see Fig. 3).

10. Connect a 1-volt modulated staircase signal to the VIDEO INPUT A connector.

NOTE: If the TSM-5 is connected to the output of a video signal distribution system, connect a 75 ohm termination resistor to the other unused VIDEO INPUT A connector.

11. Set the VOLTS FULL SCALE switch to A1. Use the Vertical POSITION control to align the blanking level of the waveform with the 0 IRE graticule line. A modulated staircase waveform similar to the one shown in Fig. 4A will be displayed. The FLAT position of the RESPONSE switch provides a flat frequency response from 25 Hz to approximately 5 MHz.

12. Set the response switch to IRE (see Fig. 4B). This position of the switch provides a frequency response with a rolloff as per IRE 1958 standard 23s-1.

13. Set the RESPONSE switch to CHROMA (See Fig. 4C). In this position of the switch, only the components of the signals within the 3.2 to 4.0 MHz frequency range are displayed.

14. Place the RESPONSE switch to the DIFF GAIN position. The display should be similar to the one shown in Fig. 4C except the amplitude of the DIFF GAIN display will be 3X to 5.5X greater. The DIFF GAIN switch position is used when checking the equipment for differential gain using a test signal such as modulated staircase or ramp. To perform this check, a suggested procuedure is as follows:

a. Adjust the VARIABLE (VOLTS FULL SCALE) control until the display is exactly 100 IRE units peak to peak in amplitude. Use the Vertical POSITION control to center the display about the 50 IRE unit graticule line (see Fig. 4E).

b. Check the waveform for uniform amplitude. The departure of any portion of the staircase modulation from the 100 IRE units of amplitude chosen as a reference represents a differential gain.

15. Set the VARIABLE (VOLTS FULL SCALE) control to CAL, the RESPONSE switch to FLAT and the SWEEP switch to 1us/DIV. A magnified display of the horizontal blanking interval should be obtained. A typical display is shown in Fig. 4F.

16. Set the SWEEP switch to 2V and note that a two field display is obtained (see Fig. 4G).

17. Set the SWEEP switch to 2V MAG. Observe that a magnified display of the vertical blanking interval is obtained (see Fig. 4D).

18. Set the VOLTS FULL SCALE switch to A 4V and the SWEEP switch to 2V. Observe that the vertical amplitude of the display is one-fourth of the display amplitude obtained in Step 16; that is, one fourth amplitude is about 35 IRE units peak to peak. The A 4V and B 4V positions of the VOLTS FULL SCALE switch are primarily used to observe composite sync signals that are 4 volts in amplitude but these switch positions may also be used in conjunction with the VARIABLE (VOLTS FULL SCALE) control to observe composite video signals whose amplitudes lie between 1 and 4 volts.

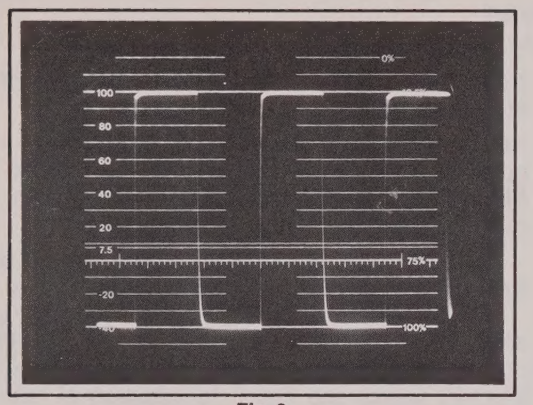


Fig. 3

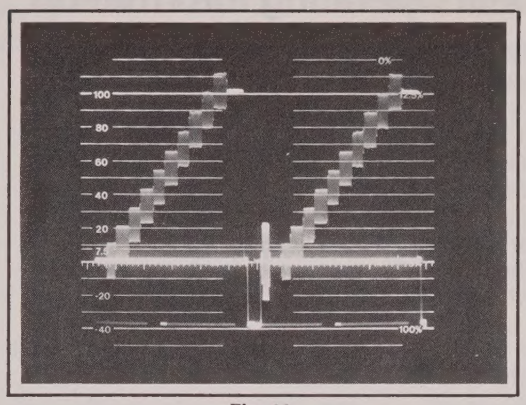


Fig. 4A

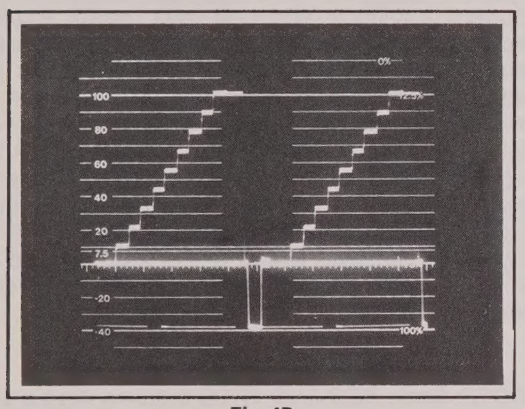


Fig. 4B

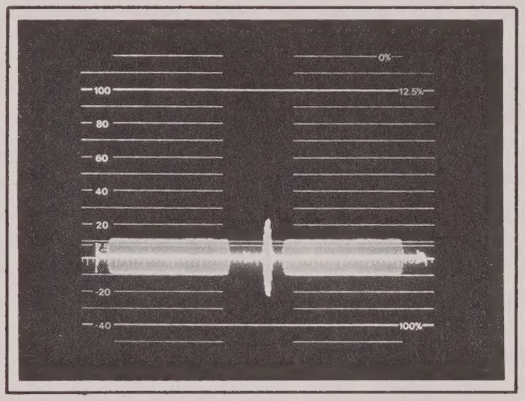


Fig. 4C

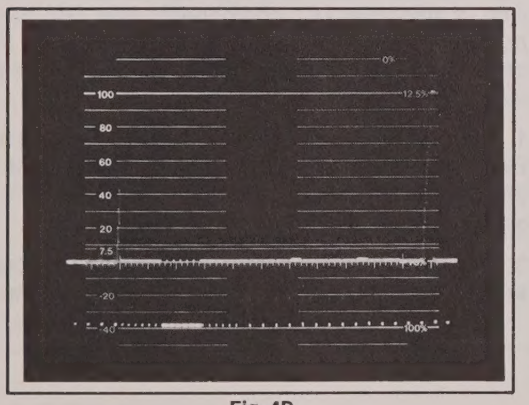


Fig. 4D

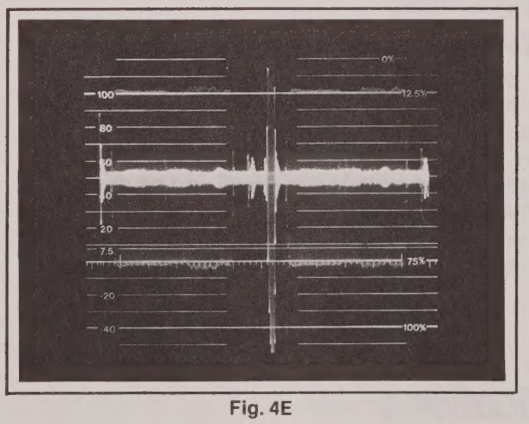


Fig. 4E

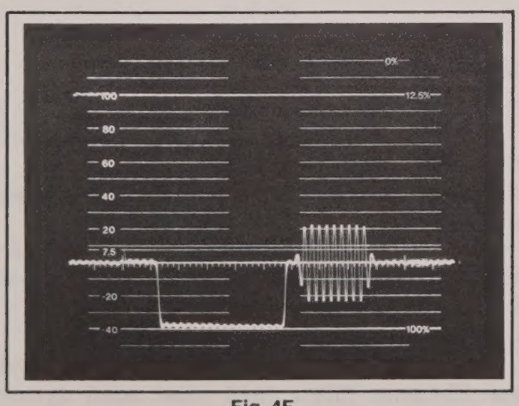


Fig. 4F

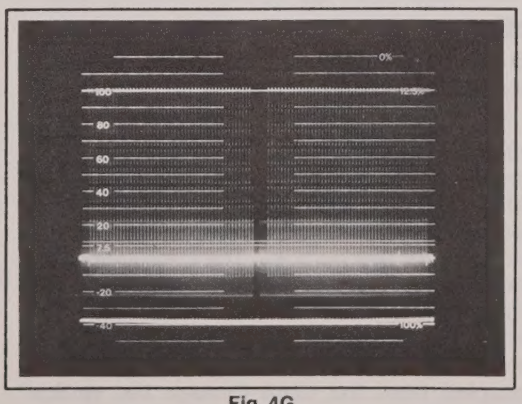


Fig. 4G

Additonal Operating Information

Video Input A, Video Input B

Two pairs of BNC connectors are provided for accepting 1 volt or 4 volt input signals. These connectors are VIDEO INPUT A and VIDEO INPUT B, selectable by the VOLTS FULL SCALE switch. The video inputs provide high impedance loop-through compensated for 75 ohms connections so that the instrument may be connected into any part of a properly terminated 75-ohm system.

When the TSM-5 is connected to the output of a system where loop-through connections are not required, a 75-ohm terminating resistor should be connected to the unused imput connector to properly terminate the system.

Video Out

The VIDEO OUT connector (BNC Type) permits monitoring the TSM-5 displayed signal on a picture monitor. The output signal is 1 volt ±15% for 140 IRE units of signal amplitude displayed on the TSM-5 CRT when the RESPONSE switch is set to FLAT and the VIDEO OUT connector is connected to a properly terminated system. Output impedance is 75 ohms.

External Sync

A pair of BNC marked EXT SYNC is provided on the rear panel to couple an external negative-going sync signal to the sweep circuit when the SYNC switch is set to the EXT position. This input is a 75-ohm loop-through connections. The unterminated input impedance is about 15k. The input sync signal requirement for synchronizing the TSM-5 sweeps is a 1.5 volt to 4.5 volts composite sync signal.

RGB—YRGB J905

A 9-pin socket connector is provided to connect an external staircase signal. The input impedance between pin 3 (staircase signal input) and ground is 1 MEG shunted by 48pf. Figure 5 shows how to wire the male plugs (supplied) so the staircase signal can be applied to the instrument. In addition, the illustrations show several ways to energize the RGB/YRGB mode. It can be activated directly or remotely using internal or external power.

NOTE: Be careful to observe proper polarity when making connections to the 9-pin plug.

NOTE: If the external voltage is greater than 15 volts, connect a resistor in series with the voltage source. Resistance and wattage of the series resistor can be determined using the following information:

Control circuit internal resistance is 680 in series with a diode that has a forward drop of approximately 1.5V.

When RGB mode is actuated and the SWEEP switch is set to 2H or 2V, the sweep length is 27% to 33% of the normal sweep length if the RGB jumper P210 is installed (Factory wired; see Fig. 6 for location of test points). Then, when a 20 Hz 3-step RGB staircase signal of correct amplitude (about 10 volts overall amplitude) is applied through pin 3 of J905 the display will be properly positioned if the DC Level control VR621 is properly adjusted. The total length of the three stepped sweeps will be approximately equal to a normal sweep-trace length in accordance with the staircase output from a color processor. For YRGB operation, proper sweep length is 20% to 25% of normal sweep. When the YRGB signal is applied to pin 3 of J905, the signal will step the sweep so the total length of the four stepped sweeps will be approximately equal to a normal sweep-trace length.

NOTE: Some RGB AND YRGB systems have a staircase signal output with a positive DC component and so with a negative DC component. The DC component positions the display to the left or right of the CRT, depending on the polarity. To properly position the display, proceed as follows:

1. De-energize RGB mode and set the switch to 2H or 2V. Check that the sweep starts at the first left major graticule division mark.
2. Energize the RGB mode.
3. Adjust the DC level control VR621 so the display starts at the same point as the normal (2H or 2V) sweep.

Modifications

Introduction

The TSM-5 can be modified to satisfy certain studio conditions. Some possible modifications are as follows:

1. Changing to DC Input Coupling

Sometimes it is necessary to observe the demodulated output from a television transmitter using a DC oscilloscope. The TSM-5 vertical amplifier can be DC coupled and used for this purpose. The information that follows describes how to make the modification:

Connect a jumper wire to P100 as shown in Fig. 7. The jumper shorts out coupling capacitor C101 and all signals selected by the VOLTS FULL SCALE switch are now DC coupled from the input through the vertical amplifier to the CRT vertical deflection plates with the RESPONSE switch set to FLAT or IRE.

2. Changing 3-Step Mode of Operation to 4-Step YRGB

Refer to the topic entitled, "RGB/YRGB" that precedes MODIFICATIONS.

3. Eliminating the CRT Blanking During RGB/YRGB Mode of Operation

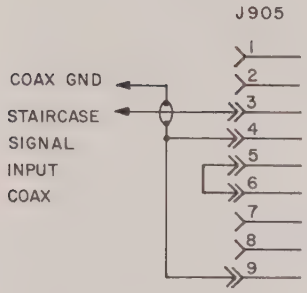
To observe the entire RGB/YRGB display (including retrace), connect a short jumper wire to P209 as shown in Fig. 6.

4. Changing to 625-Line 25-Frame Scan

The TSM-5 can be easily modified to work with a 625-line 25-frame (50Hz field rate) scan system. (See instrument options page 5-1.)

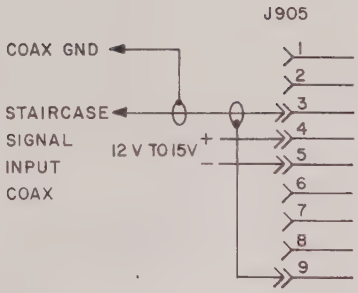
RGB / YRGB
External Connection Options

OPTION A
RGB / YRGB



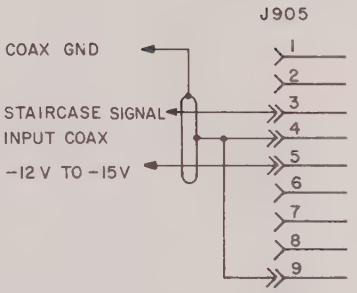
THE STAIRCASE SIGNAL IS APPLIED TO J905-3. RGB MODE IS ACTIVATED BY AN INTERNAL VOLTAGE WHEN THE PLUG IS INSERTED INTO THE SOCKET.

OPTION B
RGB/YRGB



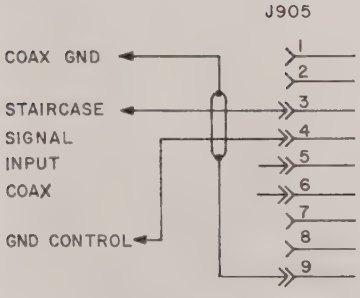
THE STAIRCASE SIGNAL IS APPLIED TO J905-3. RGB MODE IS ACTIVATED BY A TWO WIRE EXTERNAL VOLTAGE SOURCE.

OPTION C
RGB/YRGB



THE STAIRCASE SIGNAL IS APPLIED TO J905-3. RGB MODE IS ACTIVATED BY AN EXTERNAL VOLTAGE AND GROUND CONNECTION.

OPTION D
RGB/YRGB

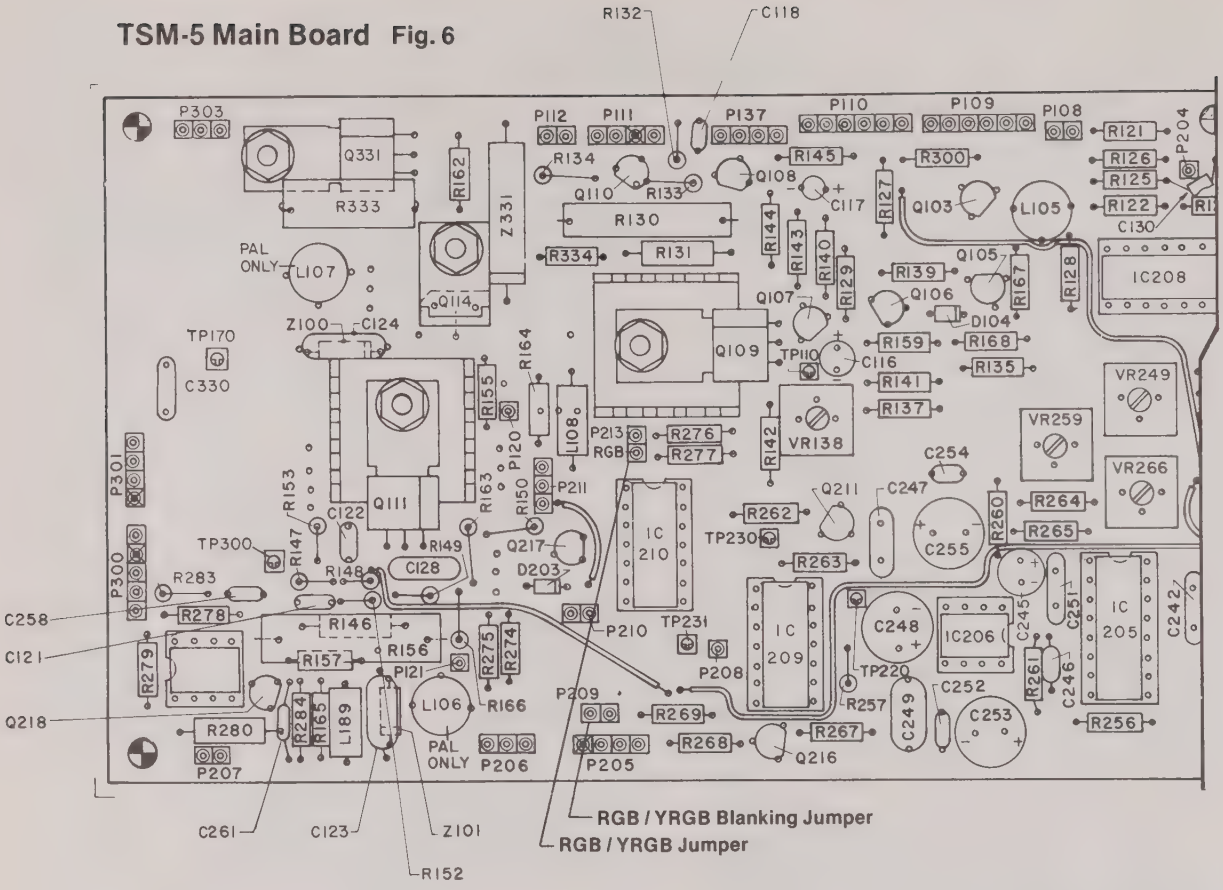


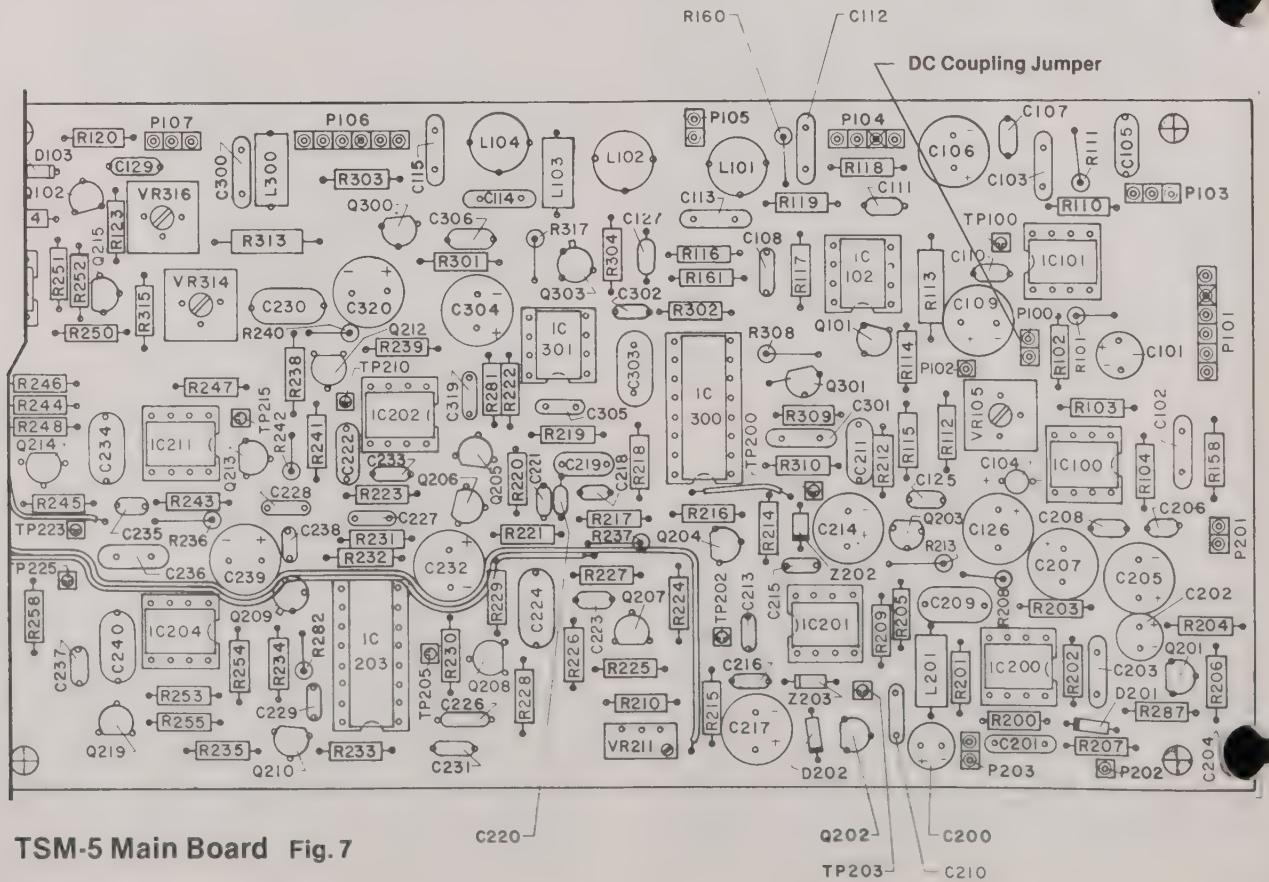
THE STAIRCASE SIGNAL IS APPLIED TO J905-3. RGB MODE IS ACTIVATED BY AN EXTERNAL GROUND CONTROL CONNECTION AND THE INTERNAL VOLTAGE.

NOTE: IF THE EXTERNAL VOLTAGE IS GREATER THAN 15 VOLTS, CONNECT A RESISTOR IN SERIES WITH THE VOLTAGE SOURCE. RESISTANCE AND WATTAGE OF THE SERIES RESISTOR CAN BE DETERMINED USING THE FOLLOWING INFO:
THE CONTROL CIRCUIT RESISTANCE IS A 680 RESISTOR IN SERIES WITH AN OPTO ISOLATOR LED THAT HAS FORWARD DROP OF APPROXIMATELY 1.5 VDC.

Fig. 5

TSM-5 Main Board Fig. 6





TSM-5 Main Board Fig. 7

Theory of Operation

Ref. TSM-5 Block Diagram, Exploded View.

Video is applied to either of two looping BNC inputs on the chassis rear.

The volts full scale select switch selects "A" video, calibrator square wave or "B" video input.

The video input buffer amp receives the selected video or the square wave calibrator input, buffers, amplifies and provides drive to the 4 to 1 attenuator circuit.

The 4 to 1 attenuator is a passive frequency compensated circuit. Its purpose is to permit the display of 4V signals on the TSM-5 such as terminated studio sync. There is also a variable control which permits an increase in amplifier gain of up to 5 times.

The output of the attenuator feeds two cirucits; the video output amp, which is only affected by the 4 to 1 attenuator, and the buffer amp, IC101, which is affected both by the 4 to 1 attenuator and the variable video gain control.

The buffer amp, IC 101, drives the response filter circuit. The filter response, flat, IRE, chroma differential gain is selected by a four position lever switch on the front left hand panel. The characteristics of each of these modes is described in the specifications section of this manual.

The output of the filter feeds a buffer amplifier. The output of the buffer, Q102, Q103, feeds the DC restorer circuit and the vertical deflection driver.

The vertical deflection driver, Q105, Q106, provides the drive for the final vertical deflection amp Q112, Q113, Q114, which drive the vertical deflection plates in the tube.

The square wave calibrator is a 20k Hz square wave oscillator which supplies an amplitude of 1V p-p ±1% to the input video amplifier. The calibrator only runs in calibrator mode. In all other modes it is disabled.

The DC restorer, composed of Q300, Q301, IC300, IC301, is a "sample and hold" circuit which measures DC level of the horizontal back porch and corrects the the vertical position of the display to maintain the pedestal level of the video signal at any point selected by the vertical position control.

The differential gain relay is actuated by the fourth positon on the filter response switch and changes the "AC" gain of the vertical output stage by 5X.

The video output amp provides drive for a monitor or other device according to the specifications given. Its output is affected by the 4:1 attenuator switch.

Sync separator IC200, IC201, is driven by either external sync or internal video. The sync separator is based on an improved diode clamp cirucit with automatic tilt compensation. This affords synchronization of the display with video modulated by more than 100 IRE units of hum.

The sync separator output feeds the DC restorer for generation of the sampling pulse. It also drives the horizontal and vertical sync separators.

The vertical sync separator separates the vertical sync from the horizontal sync and then synchronizes the vertical oscillator. The vertical oscillator normally runs at 30 Hz or twice the field rate of the video. This oscillator is only operational when the sweep switch is in the 2V or 2V MAG position.

The horizontal sync separator separates the horizontal sync from the vertical sync. It also separates the equalizer and serration pulses from the horizontal sync, plus it allows only one horizontal pulse to occur for two horizontal line times. This horizontal pulse then synchronizes the horizontal oscillator. This oscillator is only operational when the sweep switch is in the 2H or 1 us/DIV mode.

The output pulses provide integrator reset signals to the two integrators which generate the linear sawtooth sweep signals, IC211 and IC206.

Electronic switches IC208 and IC209 select the appropriate ramp governed by the sweep switch. The selected ramp feeds the horizontal deflection amplifier and drivers. This amplifier drives the horizontal deflection plates fo the CRT.

Electronic switches IC208 and IC209 select the appropriate ramp governed by the sweep switch. The selected ramp feeds the horizontal deflection amplifier and drivers. This amplilfier drives the horizontal deflection plates of the CRT.

Electronic switches IC208, IC209 select the appropriate blanking pulse governed by the sweep switch. The blanking pulse drives the blanking amplifier IC502, Q530, Q533 which blanks the tube during beam retrace.

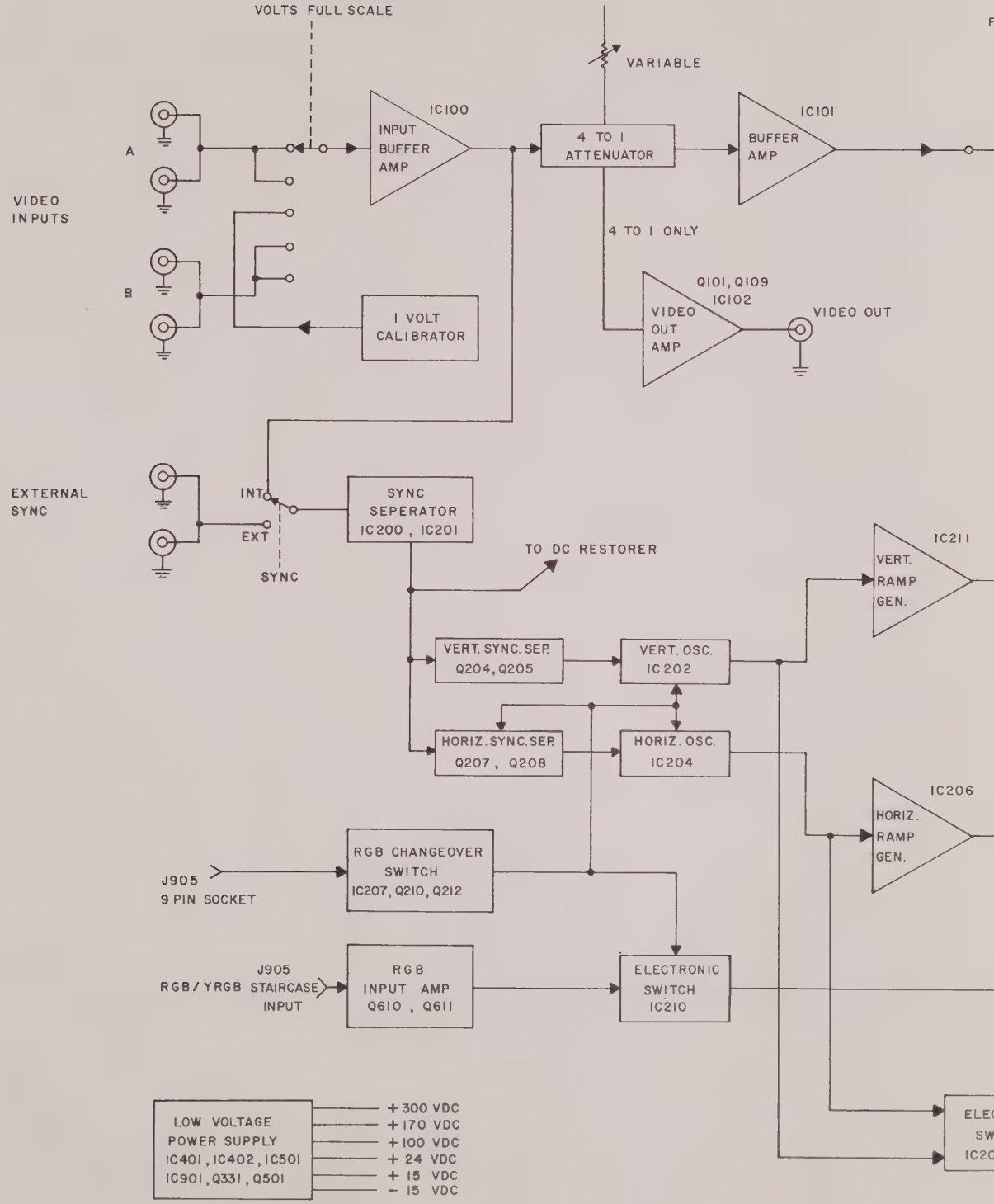
RGB/YRGB waveforms from color processing amplifiers may be displayed by activating the change over electronic switch IC207, Q210, Q212. This control changes the sweep oscillator frequencies and the ramp amplitude and lenght in RGB/YRGB (See additional operating information for RGB/YRGB, J905.) The staircase signal is fed to the RGB amplifier, Q610 and Q611 whose output is selected by electronic switch IC210 for merging with the RGB/YRGB sweep signals.

CRT protect circuit Q601, Q602 and IC601 looks for a sweep signal presence at the input to the horizontal deflection amplifiers. If the sweep signal at this point disappears for any reason, the protect circuit activates the kill line of the high voltage block and shuts down the high voltage supply. This will prevent phosphor spot burn due to sweep failure.

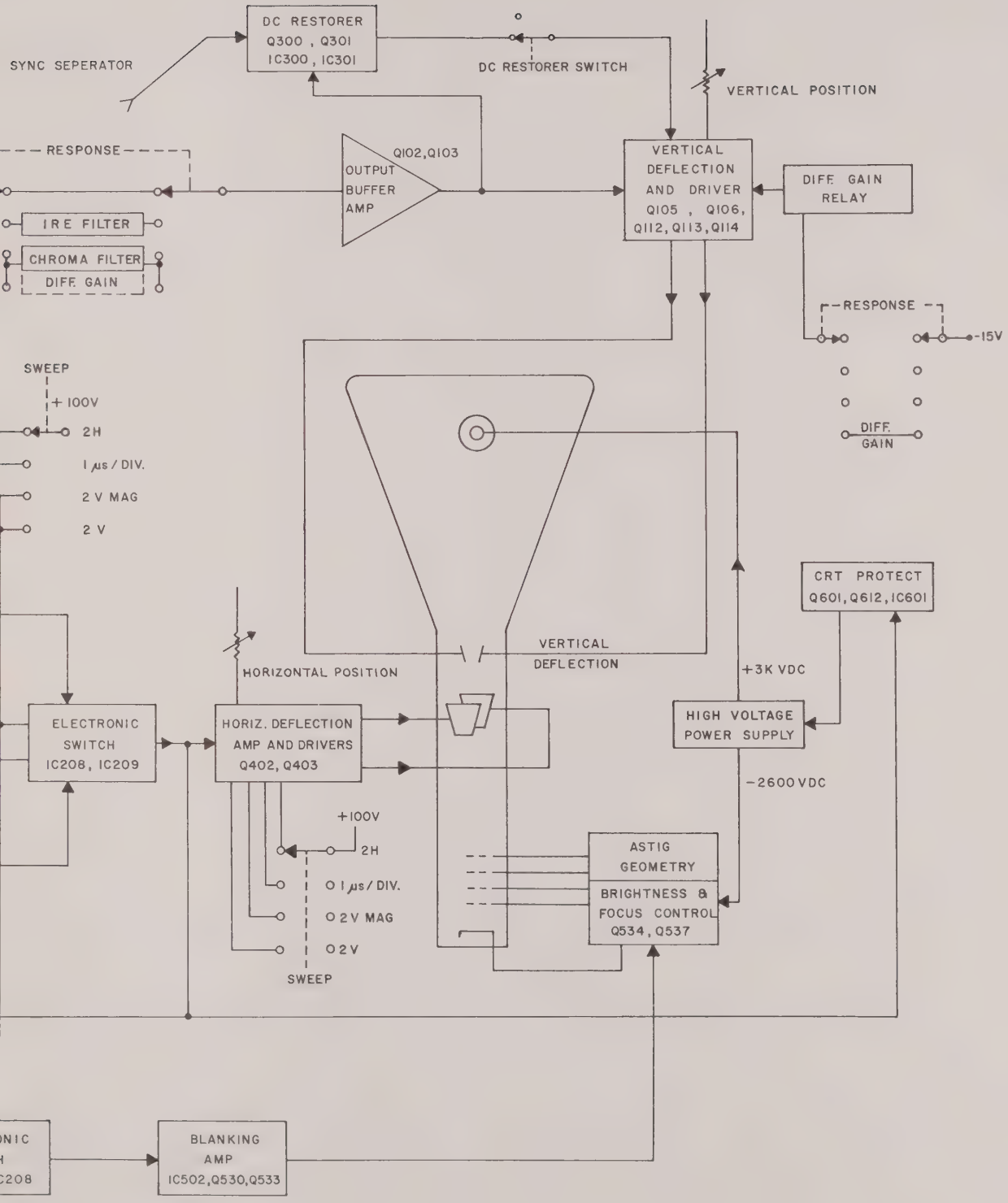
The high voltage block provides −2600VDC regulated to the CRT cathode and +3000 un-regulated to the anode cap of the CRT. The blanking control is opto coupled via IC502 and then interfaced with the brightness control circuit which is a high efficiency boot strapping configuration.

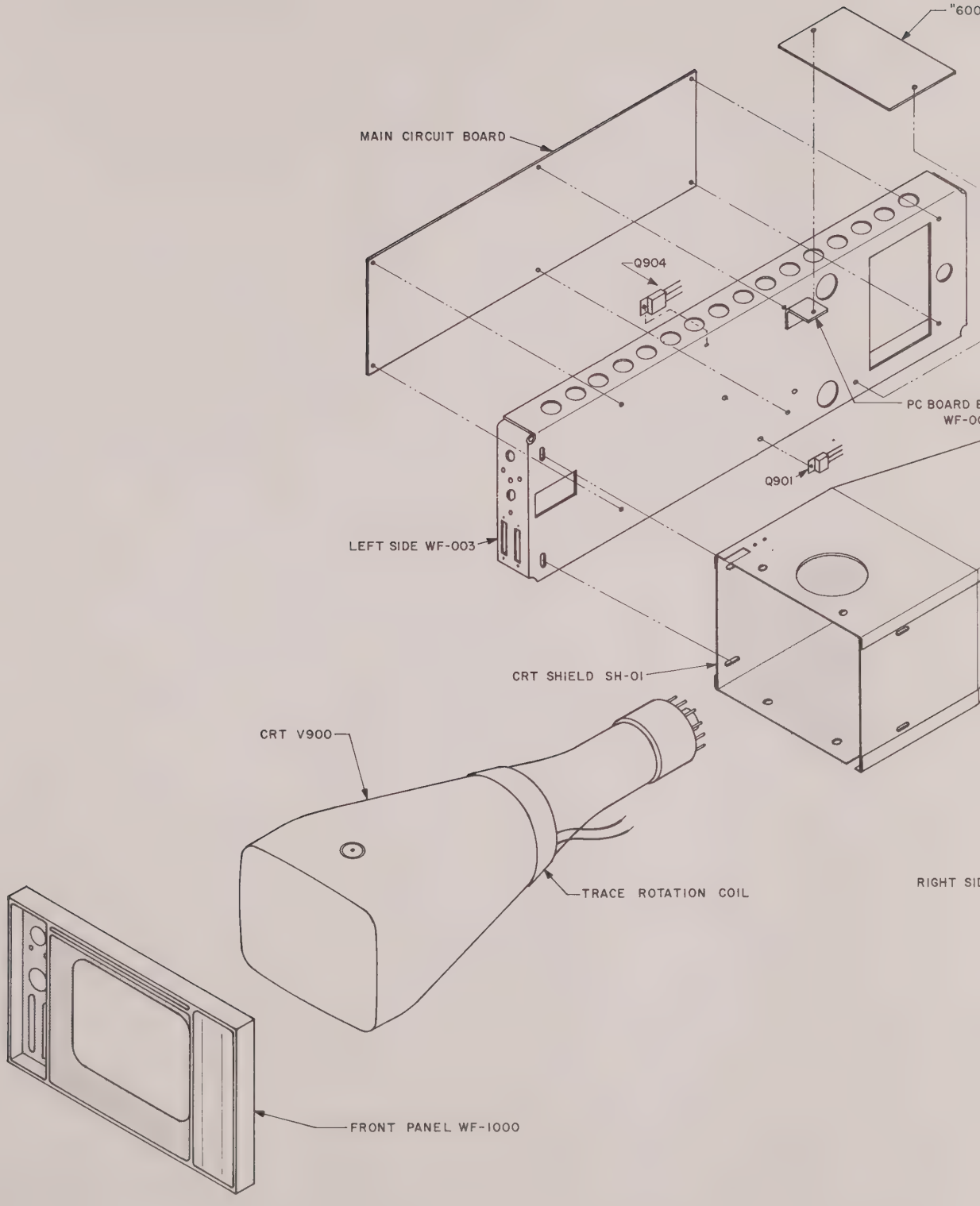
Focus, astig and geometry are simple variable resistive divider configurations.

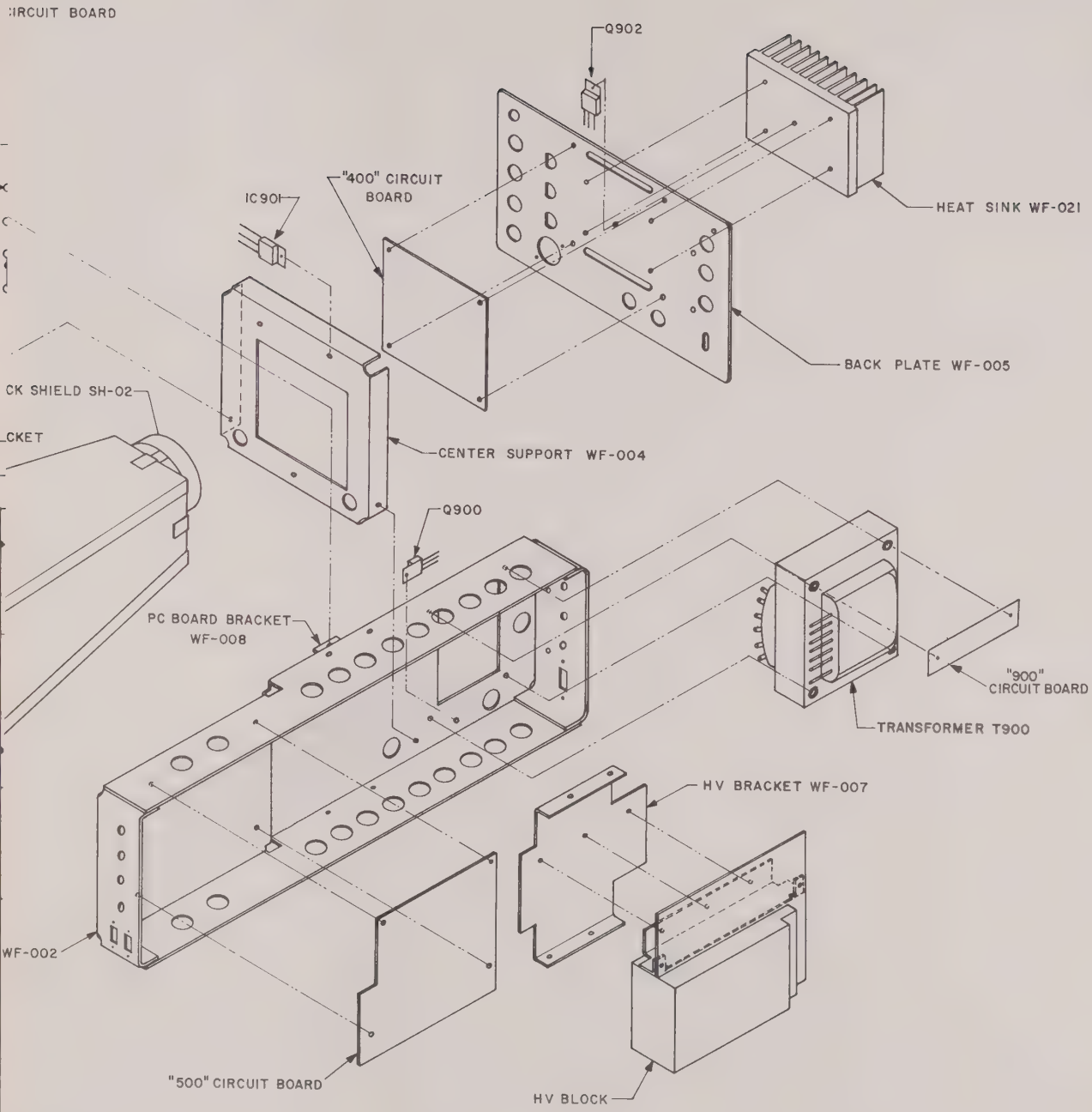
All of the low voltage power supplies are regulated with the exception of the +24V DC source.



TSM-5
Block Diagram


DC RESTORER
Q300 , Q301
IC300 , IC301
SYNC SEPERATOR
DC RESTORER SWITCH
VERTICAL POSITION
RESPONSE
Q102,Q103
OUTPUT
BUFFER
AMP
VERTICAL
DEFLECTION
AND DRIVER
Q105 , Q106,
Q112, Q113, Q114
DIFF. GAIN
RELAY
IRE FILTER
CHROMA FILTER
DIFF. GAIN
RESPONSE
-15V
DIFF.
GAIN
SWEEP
+100V
2H
1 μs / DIV.
2 V MAG
2 V
CRT PROTECT
Q601, Q612, IC601
VERTICAL
DEFLECTION
HORIZONTAL POSITION
+3K VDC
ELECTRONIC
SWITCH
IC208, IC209
HORIZ. DEFLECTION
AMP AND DRIVERS
Q402, Q403
HIGH VOLTAGE
POWER SUPPLY
-2600 VDC
+100V
2H
1 μs / DIV.
2 V MAG
2 V
SWEEP
ASTIG
GEOMETRY
BRIGHTNESS &
FOCUS CONTROL
Q534, Q537
BLANKING
AMP
IC502, Q530, Q533


"600
MAIN CIRCUIT BOARD
Q904
PC BOARD E
WF-0
Q901
LEFT SIDE WF-003
CRT SHIELD SH-01
CRT V900
TRACE ROTATION COIL
RIGHT SI
FRONT PANEL WF-1000


:IRCUIT BOARD
Q902
"400" CIRCUIT BOARD
IC901
HEAT SINK WF-021
BACK PLATE WF-005
CK SHIELD SH-02
LCKET
CENTER SUPPORT WF-004
Q900
PC BOARD BRACKET WF-008
"900" CIRCUIT BOARD
TRANSFORMER T900
HV BRACKET WF-007
WF-002
"500" CIRCUIT BOARD
HV BLOCK

Performance Check and Calibration

Performance Check

Turn unit on and allow 20 minutes warm-up.

This part of the procedure checks the operation of the instrument without removing the covers or making internal adjustments. However, screwdriver adjustments located on the rear panel are adjusted in this part of the procedure.

If the instrument does not meet the performance requirements given in the Performance Check, internal checks and/or adjustments are required.

Test Equipment Required

Some test equipment will be required for the Performance Check. Test equipment used in this procedure is described in the steps in which the test equipment is used.

All test equipment is assumed to be correctly calibrated and operating within the given specifications. If equipment is substituted, it must meet or exceed the specifications of the recommended equipment. Required equipment is as follows:

1. Digital volt meter with DC accuracy of ±.25% of reading +1 digit. AC accuracy of ±1% +2 digits. Example, Simpson model 461.

2. Test oscilloscope. Bandwidth, DC to at least 30 MHZ. Minimum input sensitivity of 5mv/cm. Tektronix type 465 with Tektronix type P6105 probes, delaying sweep.

3. Variable AC power source capable of 99 to 264 volts, 48 to 440 HZ. Example, Elgar 251 with type 400 plug-in oscillator.

4. Video signal source. Signals available, 3.58 MHZ modulated one volt linearity stairstep, composite sync pulses at a line rate with possibility to add burst and one volt SIN^2 pulse bar video signal. Multi-burst of low harmonic distortion content. Example, Tektronix model 1410.

5. Time-mark generator. Marker outputs of lus; accuracy .001%, for example, Tektronix type 184.

6. Freq. counter 10 HZ 80 MHZ with resolution to .1 HZ and display accuracy of ±1 count. Sensitivity – 20 MV RMS. Example, DC504 Tektronix.

7. Vectorscope measuring differential gain acc. of 1% and differential phase of .3°. Example, Tektronix 520.

8. Sine wave generator. 25 HZ to 5 MHZ adjustable output level. Example, Tektronix FG504.

9. Return loss bridge. Example, Tektronix 015-0149-00.

10. Assorted alignment tools.

Procedure

Connect NTSC color bars to "A" input BNC on rear and terminate. Place control switch positions in the following modes:

Initial Adjustments

1. Ext. sync = Int.

2. DC restorer = On.

3. Select switch = A, 1 volt.

4. Sweep switch = 2H.

5. Brightness = ¾CW.

6. H. position = adjust display for center of grat.

7. Grat illum. = full CW.

8. Vert. position = adj. video pedestal on "0" IRE grat. mark.

9. Focus = adjust for best possible focus.

10. Astig. control = adjust on chassis rear only if uniform focus needs optimizing. *NOTE: Asitg. interacts with focus control. Adjust both controls for best overall focus.*

11. Trace rotation = aline trace along "0" IRE grat line, if necessary. *NOTE: Adj. range is 26° min.*

12. Geometry = adjust for best geometrical display presentation.

13. Disconnect color bars from video input "A".

Calibrator Performance Check

1. Connect a 1V p-p @ 20 KHz square wave signal from a FG504 square wave generator via a 75 ohm coax to video input "A" connector. Verify amplitude with 465B scope. (Do not terminate.)

2. Verify 140 IRE units displayed ±1.4 IRE on the TSM-5.

3. Switch to calibrator mode. Verify internal calibrator is within 1% of the standard calibrator signal measured in Step 2.

4. Disconnect the square wave generator input to "A".

Performance Check Sweep Linearity

1. Connect a time marker generator of .001% accuracy, 1ms/div to "A" video input, 1V p-p, terminate in 75 ohms.

2. Place TSM-5 sweep switch in 1us/div.

3. Verify sweep linear to within ±3% over the width of the graticule excluding the first and last major horizontal graticule divisions.

4. Disconnect time mark gen. to video input "A".

Performance Check Magnifier Registration

1. Connect color bars to video input "A" and set the sweep switch to 2V.

2. Position the start of the display (left side of display) to the first major horizontal graticule division mark.

3. Set the sweep switch to 2V mag.

4. Verfiy part of the vertical blanking interval must be visible.

5. Verify entire vertical interval can be displayed by rotating horizontal position control.

6. Set the sweep to 2H.

7. Position the start of the display to the first major graticule division mark.

8. Set the sweep switch to 1us/div.

9. Rotate the horizontal position control clockwise until the start of magnified display can be seen.

10. Rotate the horizontal position control counterclockwise until the end of the magnified display can be seen.

11. Verfity that the end of magnified display can be positioned in the viewing area.

12. Rotate horizontal position control for a normal 1us/div display.

Check Sweep Rep. Rate

1. Connect color bars to video input "A".

2. Set sweep switch to 2H.

3. Verify display consists of two horizontal lines showing burst that is not interlaced.

4. Set the sweep switch to 2V.

5. Verify display consists of two fields and the vertical blanking interval between.

6. Disconnect the video signal source, 75 ohms coax cable and 75 ohms termination.

Performance Check Instrument Return Loss

1. Connect the return loss bridge to the vertical input connectors of the test oscilloscope.

2. Connect a 5MHz sine wave signal, approximately 1 volt in amplitude, from a sine wave generator via a 50 ohm coaxial cable and a 50 ohm to 75 ohm minimum loss attenuator to the signal input connector on the calibration fixture.

3. Connect the matched 75 ohm terminations to the end of each coaxial cable of the calibration fixture.

4. Set the scope for a vertical sensitivity of .2V/div each channel. Invert channel 2 and press ADD button. (A-B operation.)

5. Remove one matched 75 ohm termination and adjust the sine wave generator for a .5V, 5MHz output sine wave signal as observed on the test oscilloscope (use only one channel for measurement), then replace the matched 75 ohm termination.

6. Set the test oscilloscope for a vertical deflection of 5mV/div, both input channels AC coupled, and set for A-B operation at a sweep rate of 20 us/div with a free-running sweep.

7. Vary the sine wave generator frequency from 25 Hz to 5MHz. Insure the generator output amplitude remains constant.

8. Verfiy that the test oscilloscope display amplitude [illegible] mV or less at any frequency between 25 Hz and 5 MHz. This insures a max. return loss of - 46db or better of this frequency range.

9. Disconnect a 75 ohm termination from the end of the measuring cable then attach the measuring cable to the TSM-5 upper VIDEO INPUT A connector and the 75 ohm termination just removed, to the lower VIDEO INPUT A connector.

10. Vary the constant amplitude sine wave generator frequency from 25 Hz to 5 MHz.

11. Verify a test oscilloscope display amplitude of no more than 2.5 mV minus the signal amplitude noted in part 8 of this step, at any frequency from 25 Hz to 5 MHz.

12. Disconnect the measuring cable from the TSM-5 upper VIDEO INPUT A connector and connect it to the upper VIDEO INPUT B connector. Disconnect the 75 ohm termination from the lower VIDEO INPUT A connector and connect it to the lower VIDEO INPUT B connector.

13. Vary the sine wave generator frequency from 25 Hz to 5 MHz. Insure constant output amplitude.

14. Verfiy a test oscilloscope display amplitude of no more than 2.5 mV minus the signal amplitude noted in part 8 of this step, at any frequency from 25 Hz to 5 MHz.

15. Disconnect the measuring cable from the TS[illegible] upper VIDEO INPUT B connector and connect it to [illegible] upper EXT SYNC connector. Disconnect the 75 ohm termination from the lower VIDEO INPUT B connector and connect it to the lower EXT SYNC connector.

16. Swtich the TSM-5 SYNC switch back and forth from INT to EXT.

17. Vary the sine wave generator frequency from 25 Hz to 5 MHz. Insure constant output amplitude.

Verify a test oscilloscope display amplitude of no more than 2.5 mV minus the signal amplitude noted in part 8 of this step, at any frequency from 25 Hz to 5MHz.

19. Disconnect the return loss bridge (this includes the 75 ohm termination still attached to the TSM-5) sine wave generator, test oscilloscope, 50 ohm coaxial cable and 50 ohm to 75 ohm minimum loss attenuator.

Performance Check Vertical Gain Settings

Volts full scale = 1V cal.

Variable = Cal.

Response = flat.

Sweep = 2V.

1. Verify display amplitude is 140 ± 1.4 IRE units.

2. Connect 1Vp-p square wave signal from a squ[illegible] wave generator (FG504) to video input "B" (ve[illegible] amplitude with Tektronix 464B).

3. Select "B", 1V.

4. Verfiy that display amplitude is within 1% of 139.5 IRE units.

5. Set the square wave generator for 2V p-p. (Verfiy with 465B, Tektronix).

6. Select "B", 4V.

7. Verify 70 IRE units ±3%.

8. Disconnect calibrator source.

Performance Check, Video Out Signal Gain

1. Set the TSM-5 to 1V cal. position.

2. Connect a 75 ohm cable to the input of a test oscilloscope, from the TSM-5 video out jack and terminate in 75 ohms at the scope.

3. Verfiy that the display amplitude is 1V p-p ±15%.

Performance Check Variable Volts Full Scale

1. Connect a 1V p-p square wave generator via a 75 ohm cable to video input "B".

2. Select "B" 4V input.

3. Adjust the variable volts control clockwise. The display should slowly and smoothly increase until the display is at least 140 IRE units high when the variable control is at its full clockwise positoin.

4. Verfiy that the indicators change from green to red when rotating the volts variable control clockwise from the click position. Return control to the cal. position.

5. Disconnect the square wave generator and coax cable.

Performance Check Transient Response

1. Connect a one volt standard Sin^2 pulse bar video signal to video input "A" and terminate.

2. Select "A", 1V.

3. Set sweep to 2H mode.

4. Verify display has the following parameters:
   a. Preshoot 1 IRE unit or less.
   b. Pulse to bar ratio – .99:1 to 1.01:1.
   c. Overshoot 2 IRE units or less.
   d. Ringing 2 IRE units or less.
   e. Vertical bar tilt – 1% or less.
   f. Window tilt – 1% or less.

Performance Check Flat Frequency Response

1. Connect a one volt p-p multiburst video to "A" video input. Burst frequencies must be sinusoidal and of low harmonic content. Example, Tektronix 1410 NTSC generator with TSG6 module.

2. Set frequency range to "low" and set last burst packet to 5MHZ.

3. Select reduced amplitude output.

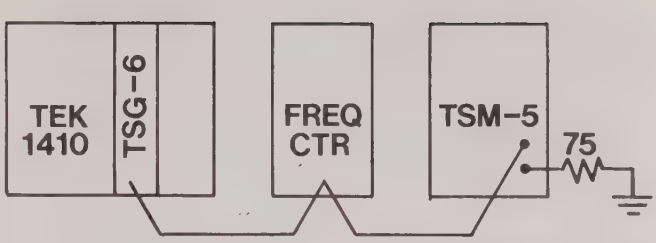
4. Verify that the burst packets from 500 KHZ to 5 MHZ are flat to within ±2 IRE units.

Performance Check IRE and Chroma Response Filters

1. Place TSG6 in continuous mode.

2. Markers off, manual freuquency adj, acitvate calibrate remote on TSG6.

3. Connect a frequency counter to TSG6 output "T" connector.



4. Set the output of the TSG6 for 100 IRE units at 3.58 MHZ.

5. Set the response switch to chroma.

6. Verify 100 IRE units displayed ±1IRE unit.

7. Leaving the output amplitude constant from the generator, adjust the freq. upward until a display is equal to 70 IRE units on the TSM-5.

8. Verify frequency of generator is between 3.8 MHZ and 4.1 MHZ.

9. Adjust the downward below 3.58 MHZ until 70 IRE units are displayed.

10. Verfiy frequency of generator is between 3.1 MHZ and 3.4 MHZ.

11. Set response switch to flat.

12. Adjust generator to 350 KHZ.

13. Verify amplitude is 100 IRE units.

14. Set response switch to IRE position.

15. Verify display is between 97.5 and 94 IRE units.

16. Set resp. switch to flat.

17. Adjust frequency of gen. to 1 MHZ.

18. Verify 100 IRE.

19. Set resp. switch to IRE position.

20. Verify display is between 80 and 70 IRE units.

21. Set resp. switch to flat.

22. Adjust frequency of gen. to 2 MHZ.

23. Set resp. switch to IRE positon.

24. Verify display is between 42.5 and 31.2 IRE units.

25. Set resp. switch to flat.

26. Adjust the frequency of the generator to 3.6 MHZ.

27. Verify 100 IRE.

28. Set resp. switch to IRE position.

29. Verify display is between 14 and 5.6 IRE units.

30. Disconnect multiburst input to TSM-5.

Performance Check Differential Gain and Phase

1. Connect a 1V p-p modulated stairstep signal to input "A" and terminate.

2. Connect the video output of the TSM-5 to the vectorscope input.

3. Verify diff. gain reading of less then 2.5% loss or gain between steps of linearity stairstep signal.

4. Set vectorscope for diff. phase measurement.

5. Verify diff. phase reading of less then 3° phase distortion between steps of linearity stairstep signal.

Set TSM-5 response switch to chroma.

7. Note display amplitude.

8. Set TSM-5 response switch to diff. gain.

9. Verify display amplitude increased from 3. to 5.5 times.

10. Adjust the volts variable control on the TSM-5 and the vertical position control until 100 IRE units centered about the 50 IRE unit line is achieved.

11. Verfiy that the display amplitude is within 1% flatness of response.

12. Disconnect modulated staircase input.

Performance Check DC Restorer

1. Set controls as follows:
   a. Volts full scale = A – 1V
   b. Variable = cal
   c. Response = flat
   d. Sweep = 2H
   e. Position controls = normal display
   f. Sync = int.
   g. DC Restorer = off

2. Connect a stairstep signal to video input "A", turn burst off. Terminate.

3. Note the appearance of the back porch portion of the display.

4. Switch DC restorer on.

5. Verify appearance of the back porch is unchanged.

6. Disconnect stairstep signal to video input "A".

7. Connect a 4 volt composite sync signal to the sync input and terminate in 75 ohms.

8. Set sync select switch to external.

9. Connect a .5V, 60 Hz sine wave to video input "A" and terminate.

10. Set TSM-5 sweep switch to 2V.

11. Set DC restorer switch to off.

12. Adjust 60HZ amplitude from generator for 70 IRE units.

13. Turn DC restorer switch on.

14. Verify amplitude of 60 HZ on the display must not be attenuated more than 10%.

15. Disconnect the sine wave generator.

16. Connect a stairstep signal to video input "A", burst off.

17. Turn DC restorer switch off.

18. Set sweep switch to 2H.

19. Sync to INT.

20. Set back porch of sync pulse on "0" IRE.

21. Turn burst on.

22. Verify trace position does not move more than 1 IRE unit.

23. Set stairstep generator to 10-90% APL alternate mode.

24. Set DC restorer switch off.

25. Verify trace shifts radically with 10 - 90% APL change. (Should bounce approx. ± 45 IRE.)

26. Switch DC restorer on.

27. Verify bounce is less than ±5 IRE units and back porch always returns to the same vertical position set point.

Performance Check External Sync

1. Connect 4Vp-p ext. sync to the channel 1 input to a scope (Tektronix 465B). Take the vertical channel "1" output and connect it to channel "2" via a "T" connector. Take a 75 coax cable from the "T" connector to TSM-5 ext. sync input. Do not terminate.

2. Set channel 2 on scope for 1V p-p display mode.

3. Set channel 1 attenuator control until 1V p-p of composite sync is at channel 2 input.

4. Select ext. sync on TSM-5.

5. Verify display is syncronized on TSM-5.

6. Disconnect scope connections to the TSM-5.

7. Connect composite sync to the ext. sync input terminated in 220 ohms (6V p-p).

8. Verify display is synchronized on TSM-5.

Performance Check RGB and YRGB Operation

1. Connect J905 as shown in Fig. 5 - Option A.

2. Set square wave generator output for 10V p-p 1KHZ centered about zero volts DC with 50% duty cycle to J905.

3. Connect a 1V p-p composite video signal to input "A" on TSM-5.

4. TSM-5 sweep mode in 2H position.

5. Verify two "H" line displays left and right which are about 27 to 33% of normal 2H sweep length. There should be room in the center for a 3rd "H" display of the same length.

6. Remove jumper P210 verify two "H" line displays left and right. (Note: The horizontal position control may need readjustment.) Each being 20-25% of normal 2H sweep length. There should be room in the center for two more "H" displays of the same sweep length.

7. Remove the plug to J905 on the rear of the TSM-5 and verify TSM-5 returns to normal 2H display. (NOTE: Horizontal position control may need readjustment).

Performance Check AC Power Line Volts Range and Line Frequency Range

1. Set back panel Line Select switch to 110VAC.

2. With variable AC power source connected, verify a normal display with the following:

P907 tap plug on	Voltage Range	
HIGH	108-132VAC	48 to 440Hz
MED	99-121VAC	48 to 440Hz
LOW	90-110VAC	48 to 440Hz

3. Turn off unit and set back panel Line Select switch to 220VAC.

4. With variable AC power source, verify a normal display with the following:

P907 tap plug on	Voltage Range	
HIGH	216-246VAC	48 to 440Hz
MED	198-242VAC	48 to 440Hz
LOW	180-220VAC	48 to 440Hz

5. Turn off unit and remove test source.

6. IMPORTANT! Make sure Line Select switch and voltage tap (P907) are reset to correct ranges.

Calibration Procedures

This part of the procedure provides the necessary calibration methods for insuring the previously outlined performance checks.

After completing the calibration of all or part of the following procedures, the performance checks pertaining to the sections calibrated should be repeated.

Test Equipment Required

1. Same DVM as outlined in performance check.
2. Same oscilloscope as outlined in the performance check.
3. Same video signal sources as outlined in performance check.
4. Assorted alignment tools.
5. Four (4) each: 1Meg, ½W, ½% resistors.
6. One (1) each: 3K, ¼W, ½% resistors.
7. One (1) each: 1K, ¼W, ½% resistors.

Power Supply Calibration

1. Pull P504 (HV kill) (Blk/org on 500 board). This disables the high voltage power supply.
2. Reposition chassis HV side *down*, tube facing you. Make sure P504 is pulled out from under unit so it will not short.
3. Connect DVM (+) to TP300, (−) lead to chassis ground, and adjust VR 435 until DVM reads +300V ±.5V.
4. Connect a 1 meg. resistor in series with a 1 meg. resistor, ½W, ½% between P120 and P121.
5. Install 1 meg resistive divider between the two socket connections on P407. NOTE: Turn on unit and allow 5 minutes warm-up.
6. Using DVM, connect + of DVM to TP401 (Rear Board) and (−) lead to the junction of the resistive divider from P407. Adjust VR453 to 0 volts. Reading should be within ±1V from zero.
7. Move (−) lead to the junction of the resistive divider between P120 and P121. Adjust VR439 for reading of 0 volts. Should be within ±1V from zero.
8. Turn off unit, remove resistive dividers.
9. Turn unit on and check for normal operation.

Horizontal Channel

Set up unit as follows: Connect video switcher to ch. B, loop to sync and terminate. Connect direct color bars to ch. A, terminate in 75 ohms.

1. Turn on and allow 20 min. warmup.

A. Sweep switch to 2V mode.
   b. Resp. switch to flat.
   c. Vert. and horz. position to normal.
   d. Brightness to normal.

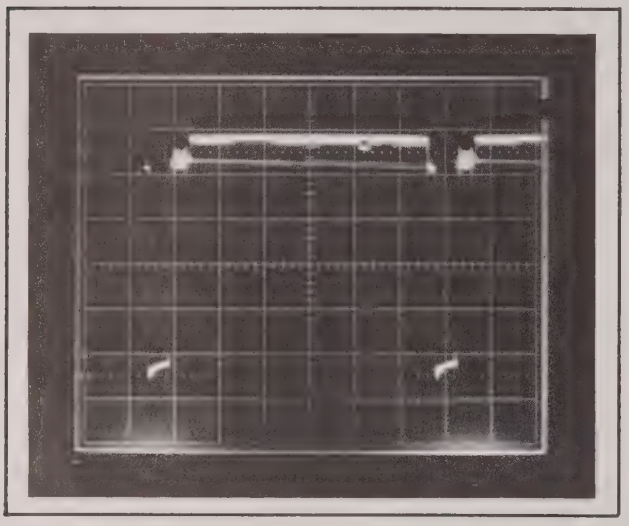
2. Align pedestal to 0 IRE line. (Check trace rotation.)
   a. Select 90% APL, B-1V input.
   b. Geometry adj. for max. squareness of trace.

c. Astigmatism (same pattern 2V mode) adj. for best focus all over. Switch to color bars (2H) and check again. Switch to 1us/div and make sure sync tip and center of display is clear to the edge.

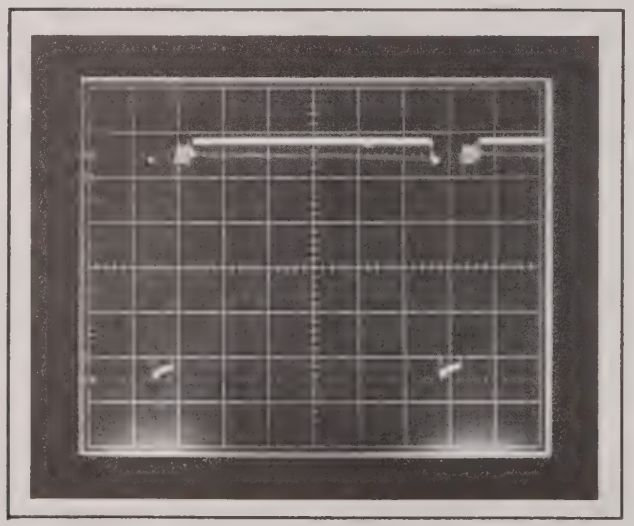
Sync Separator Calibration

1. Check TP203 (Pin 3 of comparator) with scope, x10 probe, .1V/cm scale *D.C. mode,* center sync around zero line. (See main board component layout drawing.)

2. Looking at horz. sync, flip int.-ext. switch and check for proper operation. See Fig. A and B. (More video should be visible on Internal Sync.)



Internal Fig. A **H = 10us/cm V = 2V/DIV**



External Fig. B **H = 10us/cm V = 2V/DIV**

3. Now clip on TP202 (do not adj. scope). DC line should be 50 mv below center of scope line. Adjust VR211 if setting is not correct.

4. Check TP200 (pin 6) for approx. 13V p-p pulse. (See Fig. C).

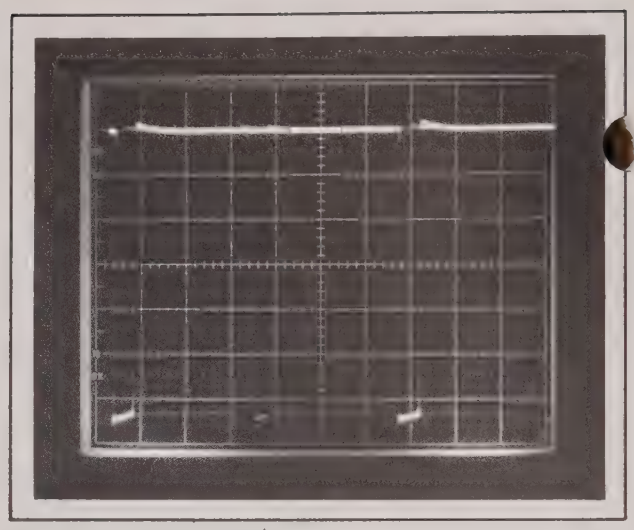


Fig. C **H = 10us/cm V = 2V/DIV**

Sweep Amplitude Calibration

1. Next go to RGB option point P210 (P210 connects R277, 12K) and set horz. ramp, VR259, to 11.6V (minus overshoot). (See Fig. D).

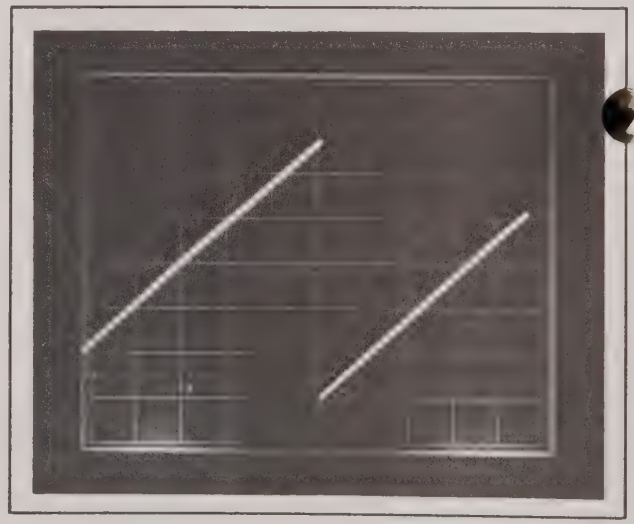


Fig. D **H = 10us/cm V = 2v/cm**

2. Turn unit on side, H.V. supply down. Put monitor in 1us/div mode, center horz. sync around zero IRE line and approx. center of screen vertically, and adjust VR422 for sync width of 4.7 us. Verify 4.7 us from video generator with Tek 465B.

3. Centering between sweep modes (color bars).
   a. DO NOT adjust horz. integrator (VR259), or horz. output gain (VR422) from this point on.
   b. Go to 1us/div. mode, and center horz. sync and back porch in center of screen, with horz. position control on front panel.

c. Set sweep switch to 2H mode, center waveform with VR424 on 400 board (middle pot). (See 400 board component layout diagram).
d. Repeat steps b and c if necessary.
e. Select 2V mag mode and center vertical sync time with VR249 (on main board).
f. Recheck horz. sweep modes.

CRT Protect Check
With unit in 2H mode, ground TP223 (pin 4 of H osc.). HV should kill (screen blank). Turn unit down, with HV cap up for next step.
Caution: Do not ground TP225.

RGB/YRGB CALIBRATION
1. Connect a 10V p-p @ 1KHZ square wave to J905 as per Fig. 5 - Option A 50% duty cycle centered about 0 volt DC.

2. Wire RGB plug as shown in FIG. 5 - Option A.

3. Remove RGB plug P210.

4. Verify YRGB display as shown in Fig. E.

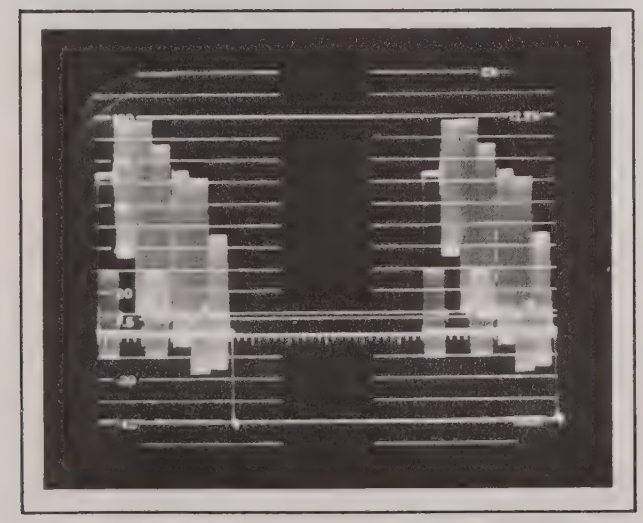
5. Insert P210.

6. Verify Fig. F.

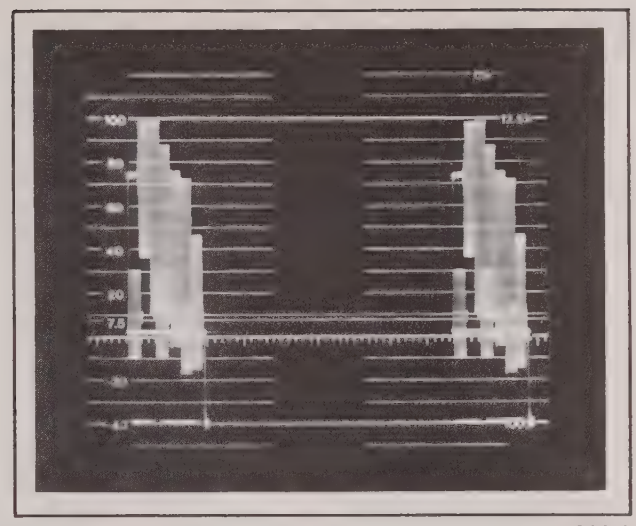
7. Check DC positioning of +7V and −7V DC offset. (Vary this on test generator. Use FG504 Tek gen.) VR621 should reposition for proper display. 10V p-p signal is centered about +7V or −7V DC level. Max excursion is ±12V peak. NOTE: This offset is set by the user depending on source situations.

8. Short RGB blanking ping (P205) on main board and check for exposure of burst, then adjust variable cap (C603) on 600 board for minimum trace overshoot.

9. Remove RGB plug on rear panel.



YRGB FIG. E TSM-5



RGB Fig. F TSM-5

Blanking Calibration
1. Select sweep switch 1us/div mode.

2. Resp. switch in flat mode.

3. Color bars in video input "A" and select A-1V.

4. Dial trace towards right of screen until edge of trace is seen. Adjust VR266 for blanking of trailing edge of the burst envelope. (Adj on main board.)

5. Position trace to the left so end of trace is exposed. Adj. VR606 to remove glow on screen. (Adj on 600 board.)

6. Dial trace to right so end of trace is exposed. Adj. VR607 to remove glow on screen.

Vertical Channel Calibration
*NOTE: All measurements that are taken from the monitor by eye in the following steps are made from approx. 15" from the monitor screen, and always looking directly dead-on to the graticule. Also, the portion of the signal being measured must be as close to the center of the WFM screen as possible to promote accuracy in measurement. This note applied to those steps marked with *. All scope readings taken at horz. rate unless otherwise specified. Set vert. sensitivity to 2V/cm, horz. 10us/cm.*

1. Check that channel A and channel B, 4 to 1 and calibrator signal all work, also that variable gain works (LED's also).

2. Setting 4 to 1 mode:
a. Secure 4 to 1 attenuator consisting of 3K and 1K½% resistors in series.
b. Attach 3K to TP100 next to IC101 on main, and (1K) end to the raised ground point of R101 also by IC101.
c. With 90% APL staircase signal in channel A terminated, front selector switch set to channel A (4V), attach scope probe to TP100 and adjust scope vertical sensitivity until trace almost fills screen. Bottom of sync and top of 90% APL line should fall on 10% and 90% markings on Tek 465B graticule. Adj. variable volts control to acheive this setting on 465B.

d. Do not adjust scope. Now change front panel selector switch on *monitor* to (1V) and also move *scope* probe to point between 3K and 1K resistors. Check scope trace, signal amplitude should be *exactly* the same. If not adjust VR105 next to IC100 for same aplitude as in (c).
e. Repeat Steps c and d if necessary.
f. Remove attenuator from TP100.
g. Set volts select to A-1V.
*h. Adj. VR138 for 140 IRE units. (Note: Verify video input to TSM-5 is 140 IRE units with 465 B scope.)
*i. Check 4 to 1 adjustment on monitor screen by expanding trace to 160 units in (1V) mode using the variable control and switching to (4V) mode. Should have 40 units, p-p video on TSM-5.

3. Frequency Response:
a. Attach color bars, direct feed, and terminated with reference termination.
b. Attach scope probe to reference color bars signal at BNC of monitor and set scope sensitivity to .2V/cm. See Fig. G.

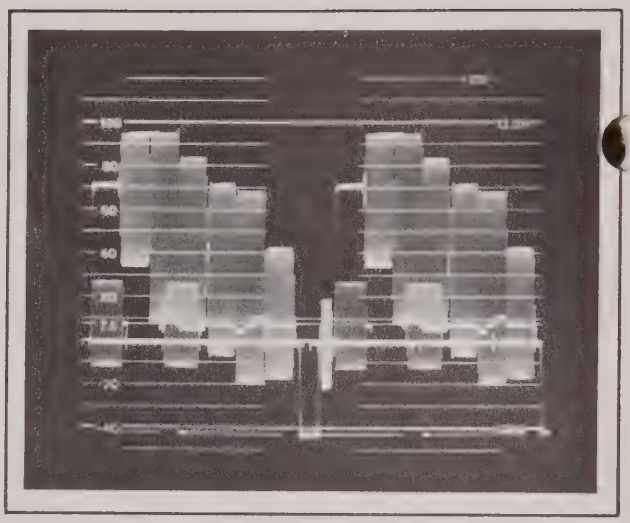


Fig. H **TSM-5**

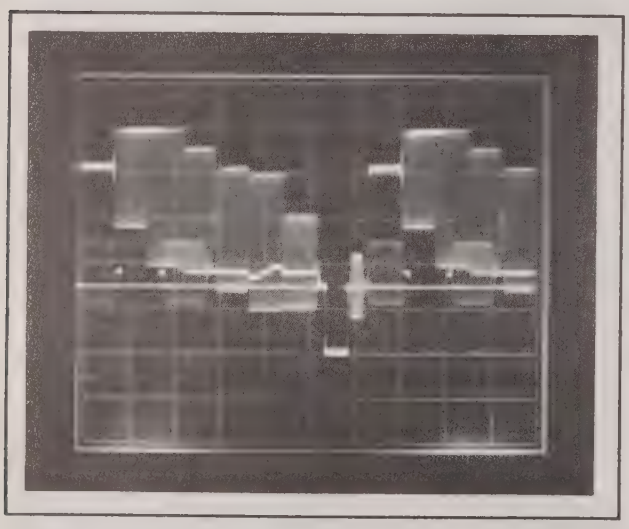


Fig. G **V = .2v/cm**
H = 10us/cm

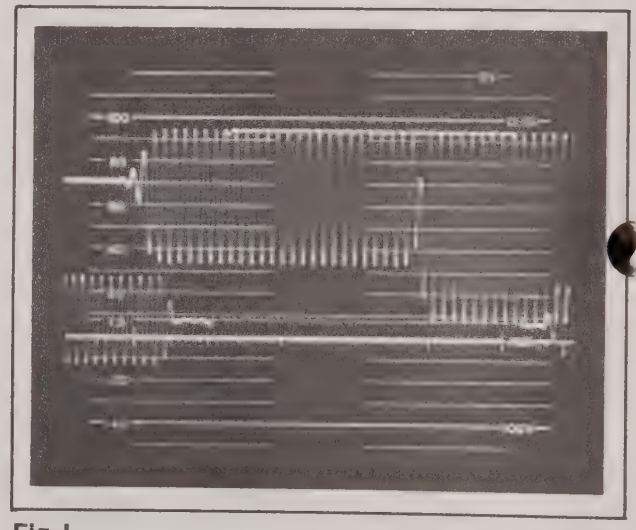


Fig. I **TSM-5**

*c. Set monitor to (1V) mode and set vertical channel gain (VR138) on color bars to 140 units p-p assuming video input is exactly 1V p-p.

NOTE: When adjusting all variable coils, turn slug in carefully.

*d. Adjust L105 until chroma amplitude is correct. (Same as reference input signal monitored by the scope Fig. h.)
*e. Switch back and forth between 2H and 1us/div. mode to check frequency response. See Fig. h and I.
f. Disconnect color bars and connect multiburst. Set last burst packet for 5MHz, reduced mode.
*g. Trim L105 for overall flatness of response if necesary.
*h. Recheck color bar frequency response.

4. Vertical channel and calibrator signal:
a. Connect scope to P603 terminal which connects to C610 and VR630 on the 600 board. Scope ground lea to frame. Turn rotary switch to "calibrator."
b. Set calibrator signal, using scope, to 1V by adjusting VR630 on top board.
*c. Check calibrator signal on screen of WFM. Should be 140 units.

d. Turn rotary switch from "calibrator" to 1V mode and check amplitude of color bars. (Amplitude of reference signal should be known in advance.)

*e. Repeat Steps c and d if necessary.

5. IRE Filter

a. Set sweep switch to 2H and response switch to FLAT.

*b. Use fourth chroma bar from left of screen (magenta) and position it towards center of screen. Expand it to 100 units (0 to 100 IRE).

*c. Select IRE mode. Same bar should be reduced to 10% modulation, and top of Y block should not have overshoot, but be as flat as possible. If necessary adjust L101. (See Fig. J.)

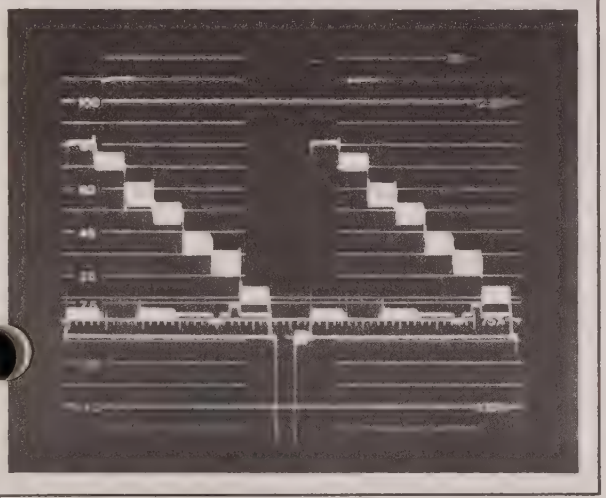


Fig. J **TSM-5**

6. Chroma Filter

a. Select flat mode and turn variable pot to calibrate mode. (grn. LED on.)

*b. Note amplitude of 3rd chroma bar from left (grn.), should be about 80 units.

c. Select chroma mode.

*d. Adjust L104 for peaking action and make tops of chroma modulation as flat as possible.

*e. Adjust L102 for flat tops, with as small as possible over-undershoot on chroma modulation. Also check burst shape for good envelope.

*f. Try to maintain the 80 units of amplitude on the green bar. Some slight readjustment of both coils may have to be done to meet all three requirements from Steps d, e and f. (See Fig. K.)

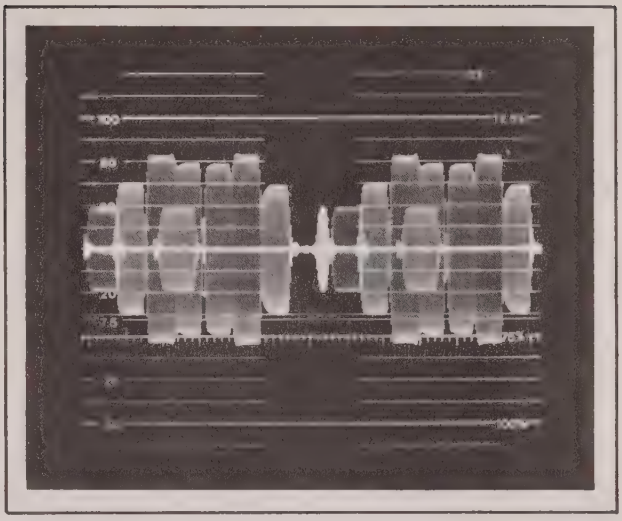


Fig. K **TSM-5**

7. Differential Gain

a. Select diff. gain mode, check that the chroma filter is expanded, burst almost 160 units. (No adjustments.)

Video Out

1. Check video out signal at BNC on the back panel – terminate 75 ohms.

2. Check on scope the amplitude and frequency response of signal. (Best to set up scope on in coming signal and then compare.)

3. If chroma is a little high, an additional 5pf across R117 may help. Should be 1V p-p ±15% and chroma amplitude should be within ±5% of the input reference.

D.C. Restorer

1. Change input signal to stairstep alternating. (Should be about ±30 IRE units of peak bounce at input BNC.)

2. With DC restorer sw. off, adjust vert. position pot so pedestal (base line) bounces equally above and below 0 IRE (approx. +30 and −30 units).

3. Switch DC restorer ON.

*4. Adjust VR316 on main board so base line of signal returns to same place on graticule each time (does not have to be any special line at this time, as long as it is the same one).

5. Now adjust VR314 so pedestal is on 0 IRE line.

*6. Repeat Steps 2, 3, 4, and 5 if necessary. (Bounce should be no more than ± 5 IRE units.

This completes calibration.

Instrument Options

Instrument Options

Your instrument may be equipped with one or more instrument options. All pertinent information about instrument options is located in this part of the Instruction Manual.

PAL Option

Introduction

The TSM-5 Waveform Monitor is modified for use with 625/50 (CCIR) television systems, and is wired for use on 230V AC power sources (unless otherwise specified).

The characteristics and other information that follow apply to the PAL Option, either in addition to, or in the place of information included in the instruction and service manual.

Characteristics

Vertical Deflection System Electrical Characteristics

Characteristic	*Performance Requirement*
CHROMA	30% down between 3.83 MHz and 4.23 MHz.
	30% down between 4.59 MHz and 5.07 MHz.
	Response at 4.43 MHz does not vary between FLAT and CHROMA by more than 1%.

Horizontal Deflection System Electrical Characteristics

Characteristic	*Performance Requriement*
SWEEP	
2V Sweep Repetition Rate	Equal to frame rate of 635/50 video or external sync.

Calibration

Calibrate as a standard instrument, substituting 625/50 composite video for that normally used when adjusting horizontal timing and gain.

When adjusting and checking the CHROMA RESPONSE filter, substitute a signal modulated with 4.43 MHz in place of the signal modulated with 3.58 MHz.

When adjusting frequency response in the calibration section, follow 3-a through 3-c and substitute the following:

*d. Adjust L105 towards bottom of coil until it becomes ineffective.

*e. Adjust L106 and L107 equally until chroma amplitude is correct. (Same as reference input signal monitored by the scope.) Flip back and forth between 2H and 1us/div. mode to check frequency response. See Fig hi and I.

NOTE: If frequency response cannot be obtained with L106 and L107, adjust L105 to achieve the balance.

f. Disconnect color bars and connect multiburts. Set last burst packet for 5MHz, reduced mode.

*g. Trim L105, L106, L107 for overall flatness of response if necessary.

*h. Recheck color bar frequency response.

i. Make Sure L106 and L107 are both physically in the approx. same distance from top of coil form. This insures balanced compensation on output drivers.

Mechanical Change for PAL Mod Only

Change graticule from NTSC to PAL.

Schematic Changes for PAL Mod Only

Value Changes (See parts list changes below.)

Designator	*Page*
R248	Page 6-2
R160	Page 6-5
R910	Page 6-5
C114	Page 6-5
C115	Page 6-5
C210	Page 6-1
C300	Page 6-4
R164, R165	Page 6-6

Add 1.5K resistor R169 in series with C103 - Page 6-5.

Add1K resistor R170 in series with C102 - Page 6-5.

Add 31-58uh adjustable coil L107 in series with R154 and collector of Q112. (Remove jumper.) Page 6-6.

Add 31-58uh adjustable coil L106 in series with R156 and collector of Q113. (Remove jumper.) Page 6-6.

Remove 25pf cap, C130. Page 6-5.

Electrical Parts List Changes for PAL Mod Only

Resistance Value Changes to Parts List

Designator	*From*	*To*	*Page*
R160	18K	10K	7-3
R164	10K	22K	7-3
R165	10K	22K	7-3
R248	150K	220K	7-4
R910	1.8K	1K	7-5

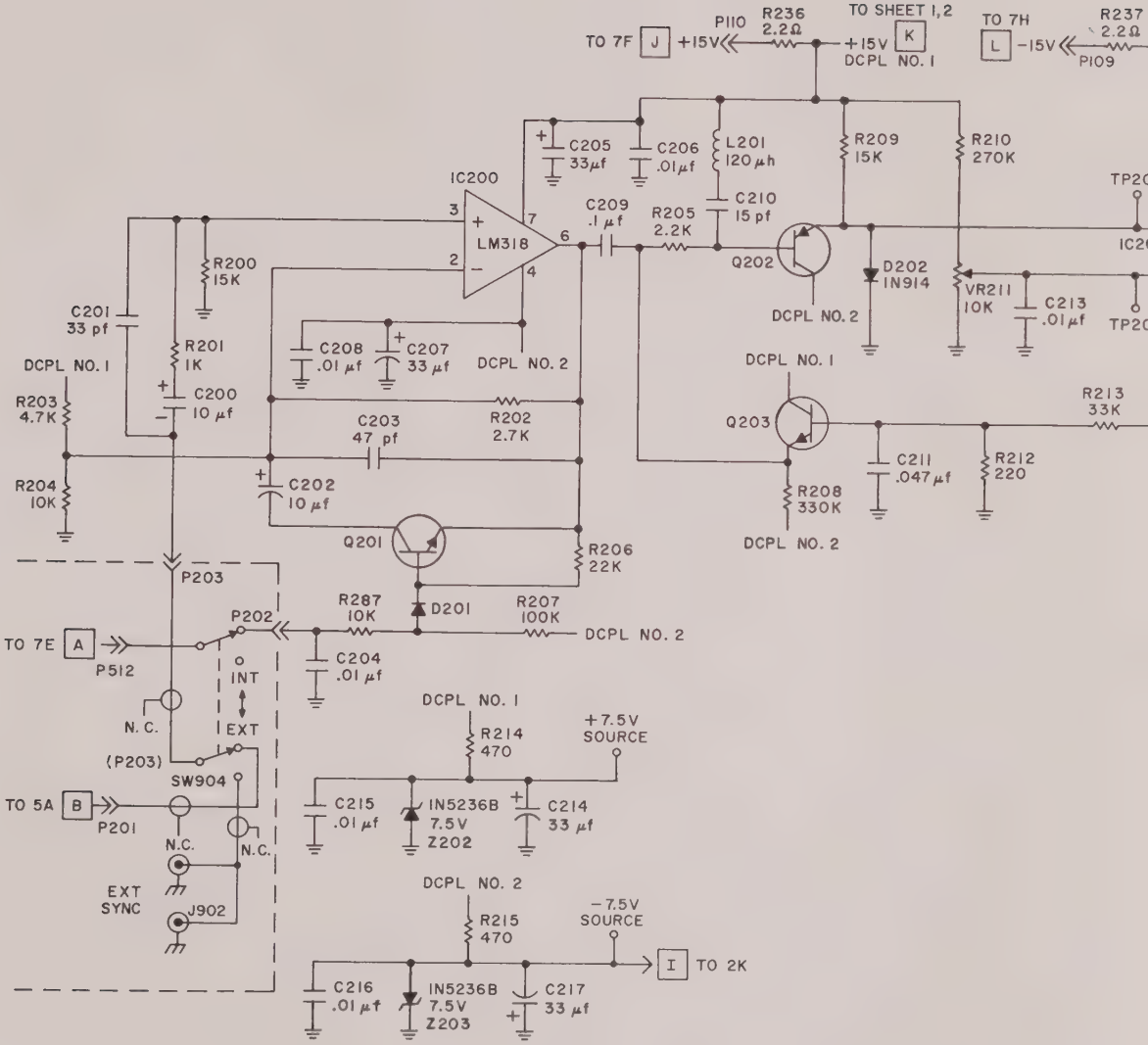
Note: Power and tolerance remain the same for all of the above.

New Additions to Parts List

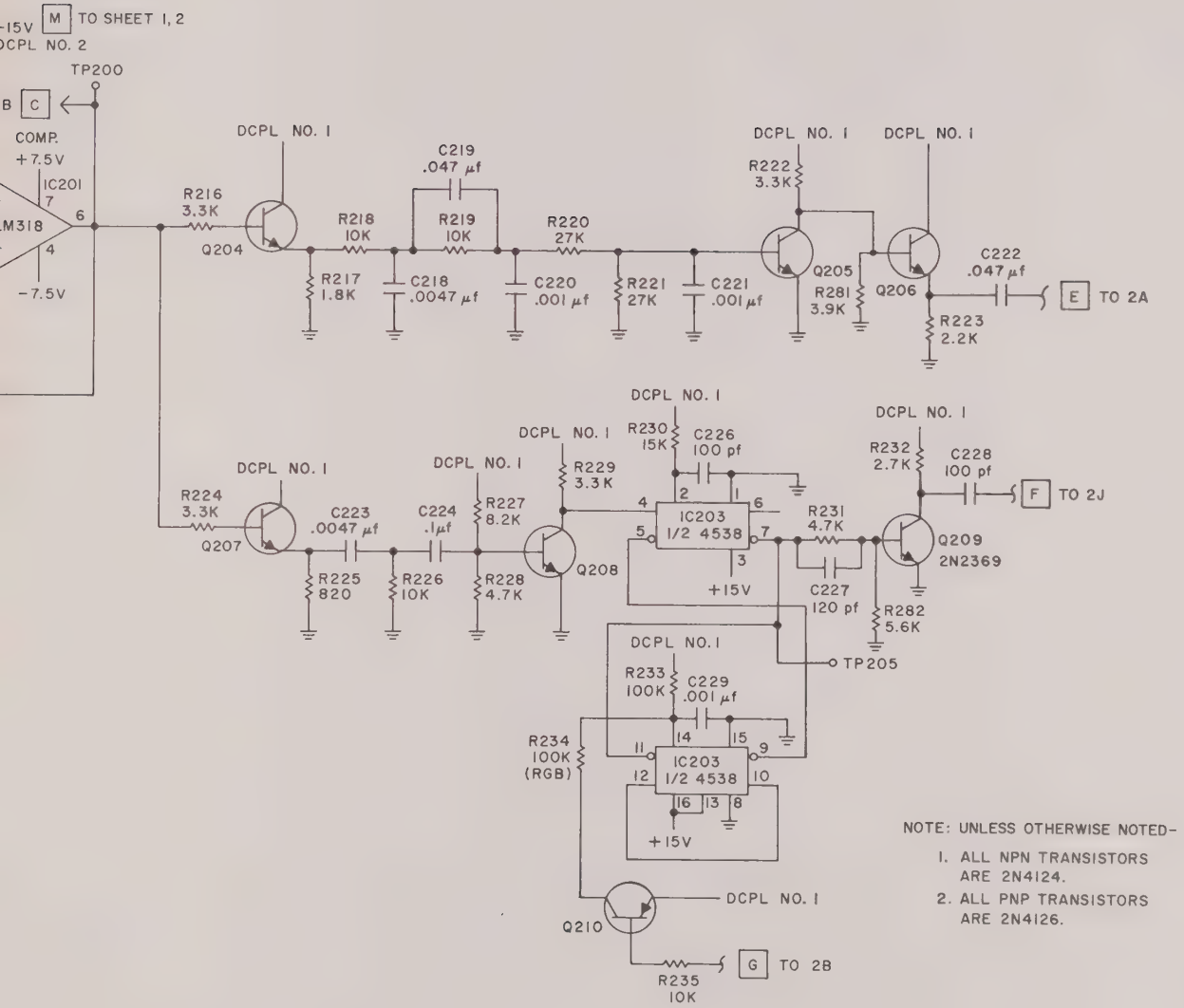
Designator				*Page*
R169	1.5K	¼wt	5%	7-3
R170	1K	¼wt	5%	7-3
L107	31-58uh adjustable coil			6-6
L108	31-58uh adjustable coil			6-6

Capacitance Value Changes to Parts List

Designator	*From*	*To*	*Page*
C114	22pf	18pf	7-1
C115	180pf	120pf	7-1
C210	15pf	11pf	7-1
C300	15pf	11pf	7-1

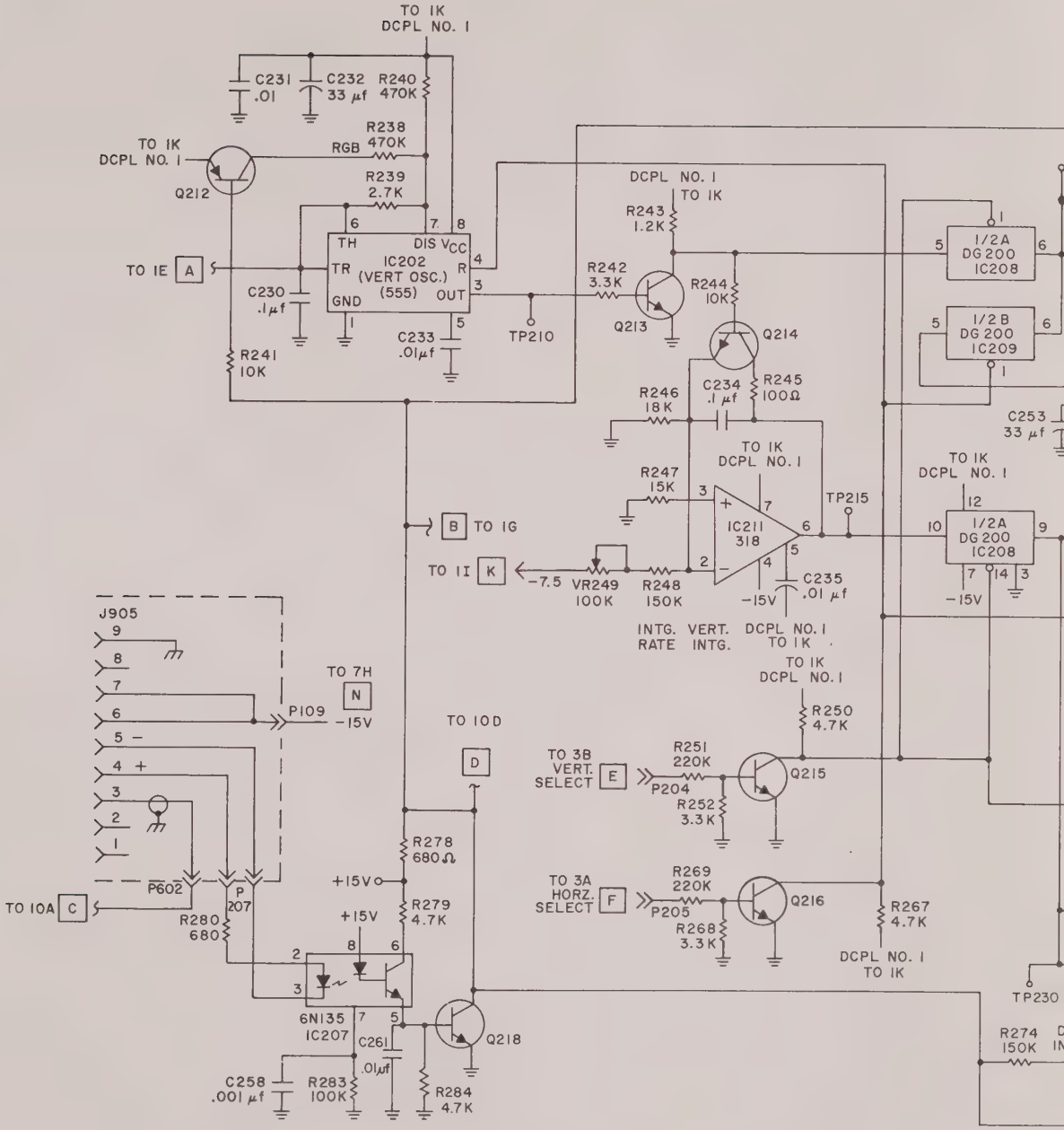


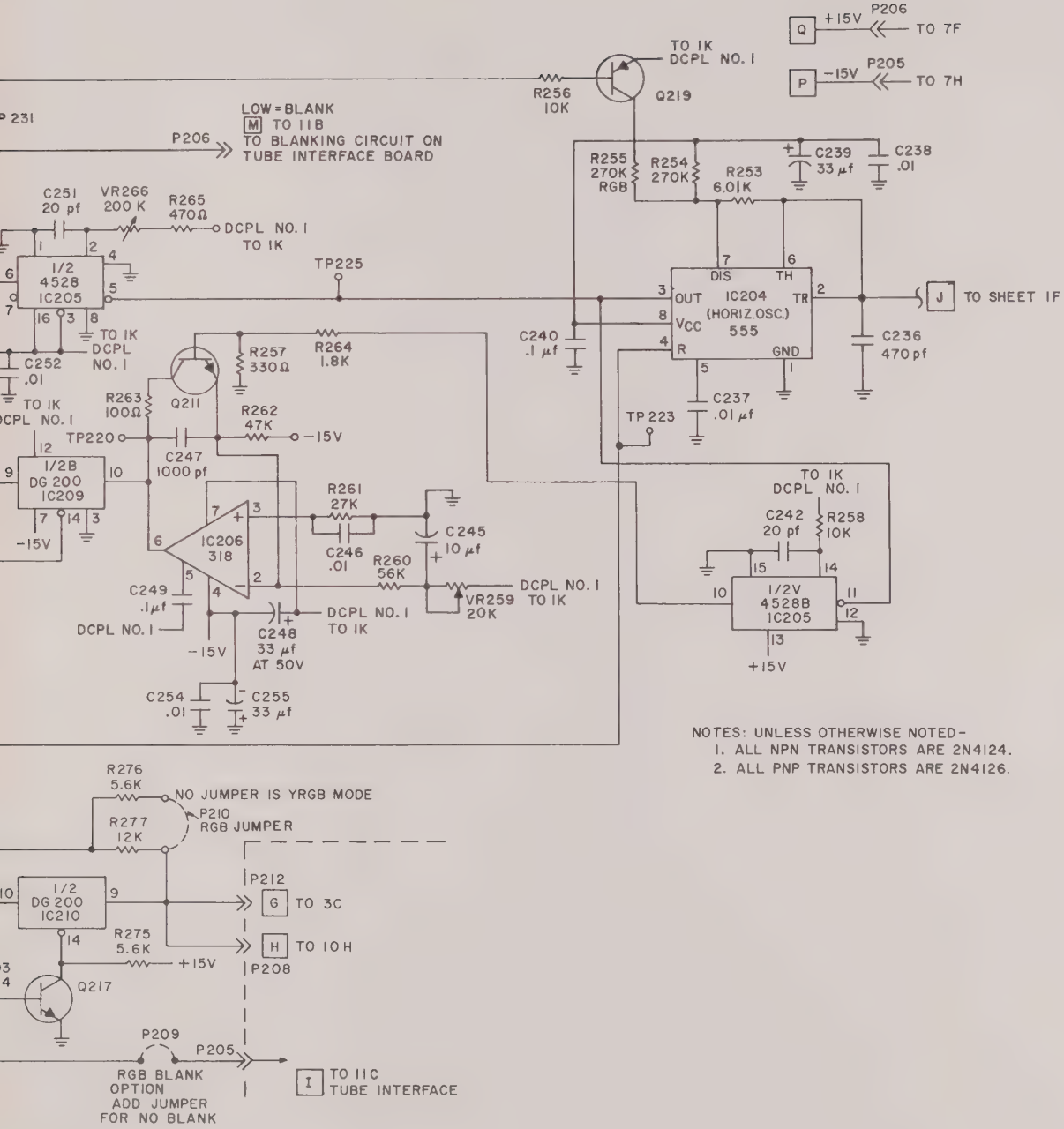
900, 200
TSM-5
Sync Seperator I



NOTE: UNLESS OTHERWISE NOTED-

1. ALL NPN TRANSISTORS ARE 2N4124.
2. ALL PNP TRANSISTORS ARE 2N4126.


TO 1K DCPL NO. 1
C231 .01
C232 33 µf
R240 470K
R238 470K
RGB
TO 1K DCPL NO. 1
Q212
R239 2.7K
TO 1E A
C230 .1µf
R241 10K
IC202 (VERT OSC.) (555)
TH
TR
GND
DIS
OUT
Vcc
C233 .01µf
TP210
DCPL NO. 1 TO 1K
R243 1.2K
R242 3.3K
Q213
R244 10K
Q214
C234 .1 µf
R245 100Ω
R246 18K
C253 33 µf
TO 1K DCPL NO. 1
R247 15K
IC211 318
TP215
B TO 1G
TO 1I K
-7.5
VR249 100K
R248 150K
C235 .01 µf
-15V
INTG. VERT. RATE INTG.
DCPL NO. 1 TO 1K
1/2A DG 200 IC208
1/2B DG 200 IC209
TO 1K DCPL NO. 1
J905
TO 7H N
P109
-15V
TO 10D
D
TO 3B VERT. SELECT E
P204
R251 220K
R252 3.3K
Q215
TO 1K DCPL NO. 1
R250 4.7K
TO 3A HORZ. SELECT F
P205
R269 220K
R268 3.3K
Q216
R267 4.7K
DCPL NO. 1 TO 1K
TP230
R274 150K
P602
P207
TO 10A C
R280 680
R278 680Ω
+15V
R279 4.7K
6N135 IC207
C261 .01µf
C258 .001 µf
R283 100K
R284 4.7K
Q218



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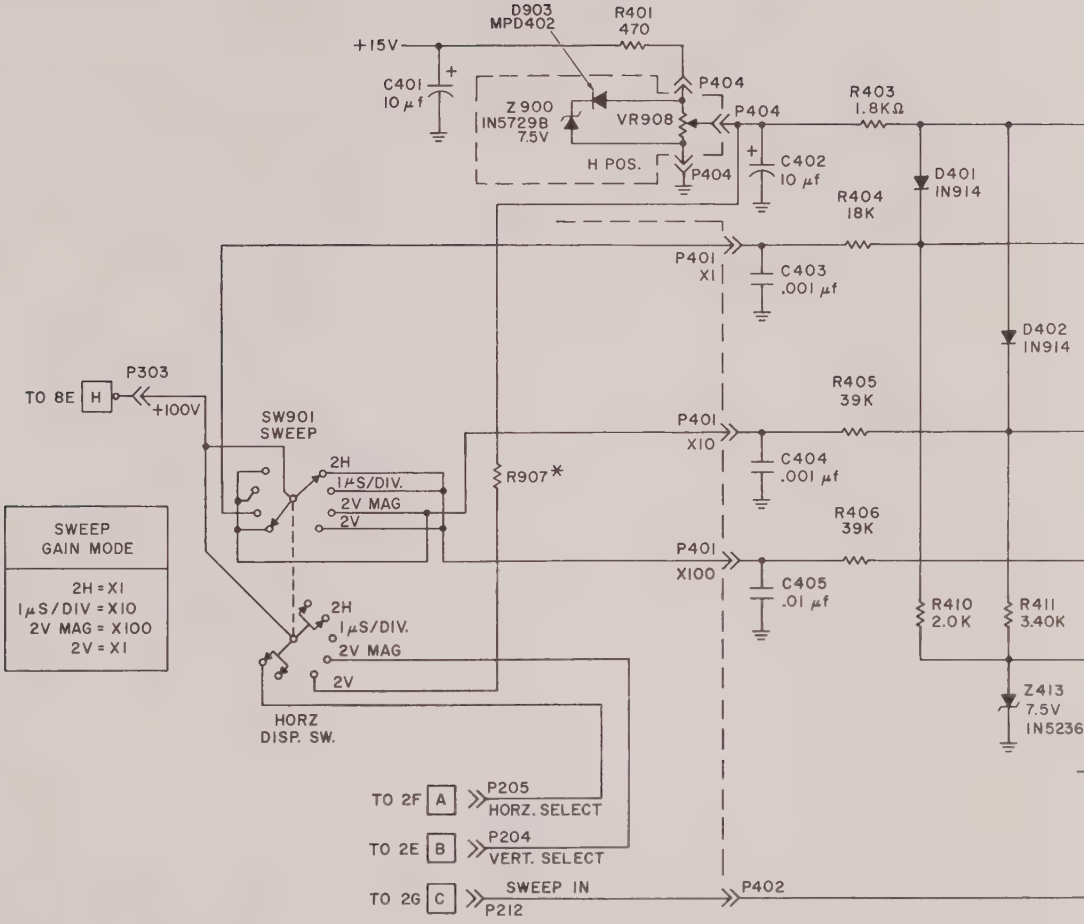
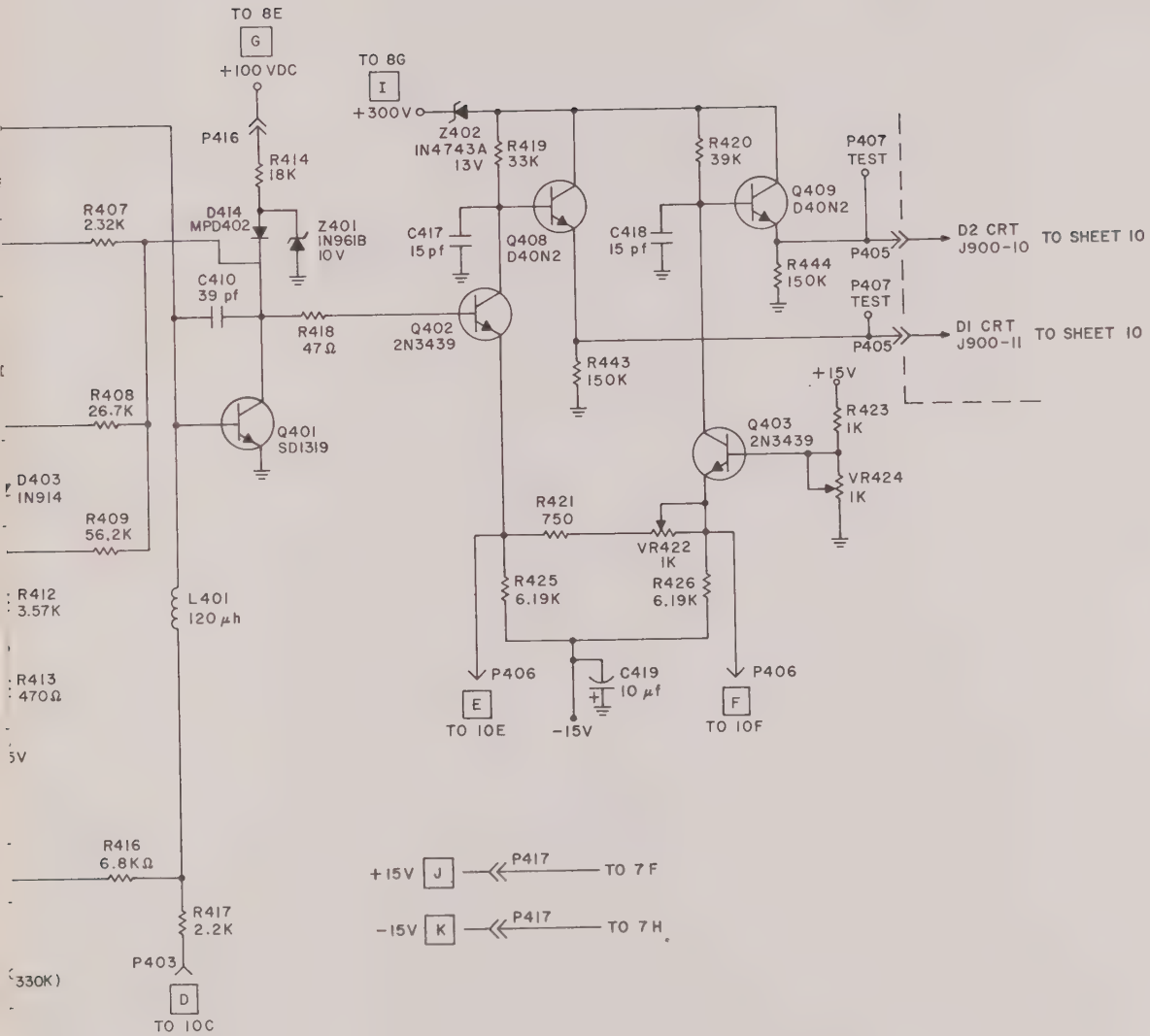
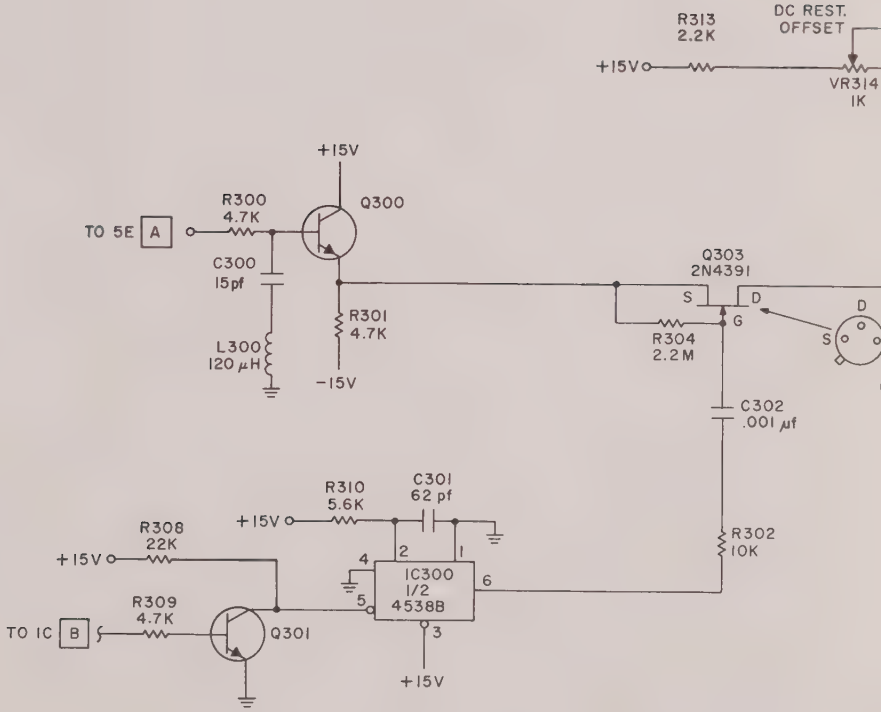
2. ALL PNP TRANSISTORS ARE 2N4126.



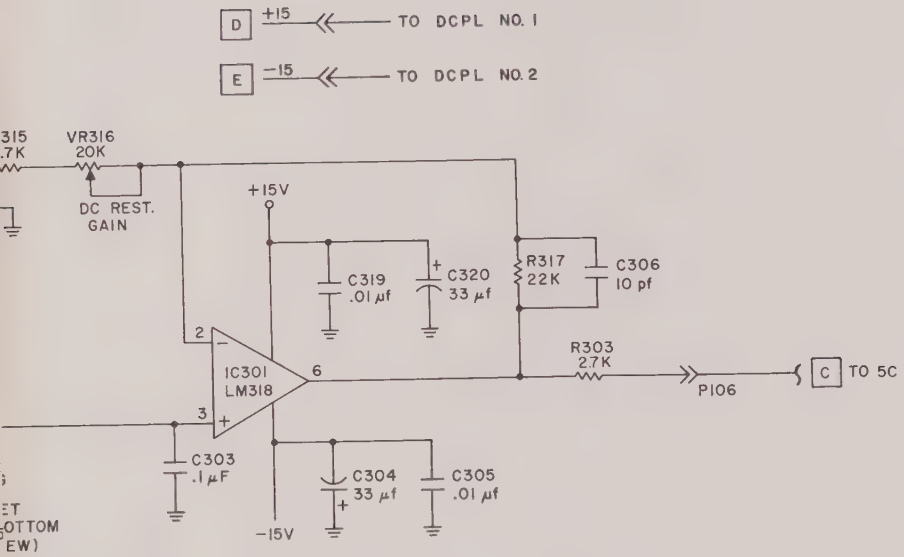
*R907 IS FACTORY SELECTED. (NOMINALL

900, 400
TSM-5
Sweep Gain & Output 5


TO 8E
G
+100 VDC
P416
R414
18K
TO 8G
I
+300V
Z402
IN4743A
13V
R419
33K
R420
39K
P407
TEST
Q409
D40N2
R407
2.32K
D414
MPD402
Z401
IN961B
10V
C417
15pf
Q408
D40N2
C418
15 pf
D2 CRT
J900-10
TO SHEET 10
P405
R444
150K
P407
TEST
C410
39 pf
R418
47Ω
Q402
2N3439
DI CRT
J900-11
TO SHEET 10
P405
R443
150K
+15V
R423
1K
R408
26.7K
Q401
SD1319
Q403
2N3439
VR424
1K
D403
IN914
R421
750
VR422
1K
R409
56.2K
R425
6.19K
R426
6.19K
R412
3.57K
L401
120 μh
P406
C419
10 μf
P406
R413
470Ω
E
TO 10E
-15V
F
TO 10F
5V
R416
6.8KΩ
+15V
J
P417
TO 7F
R417
2.2K
-15V
K
P417
TO 7H
P403
(330K)
D
TO 10C



300, 300
TSM-5
DC Restorer 4



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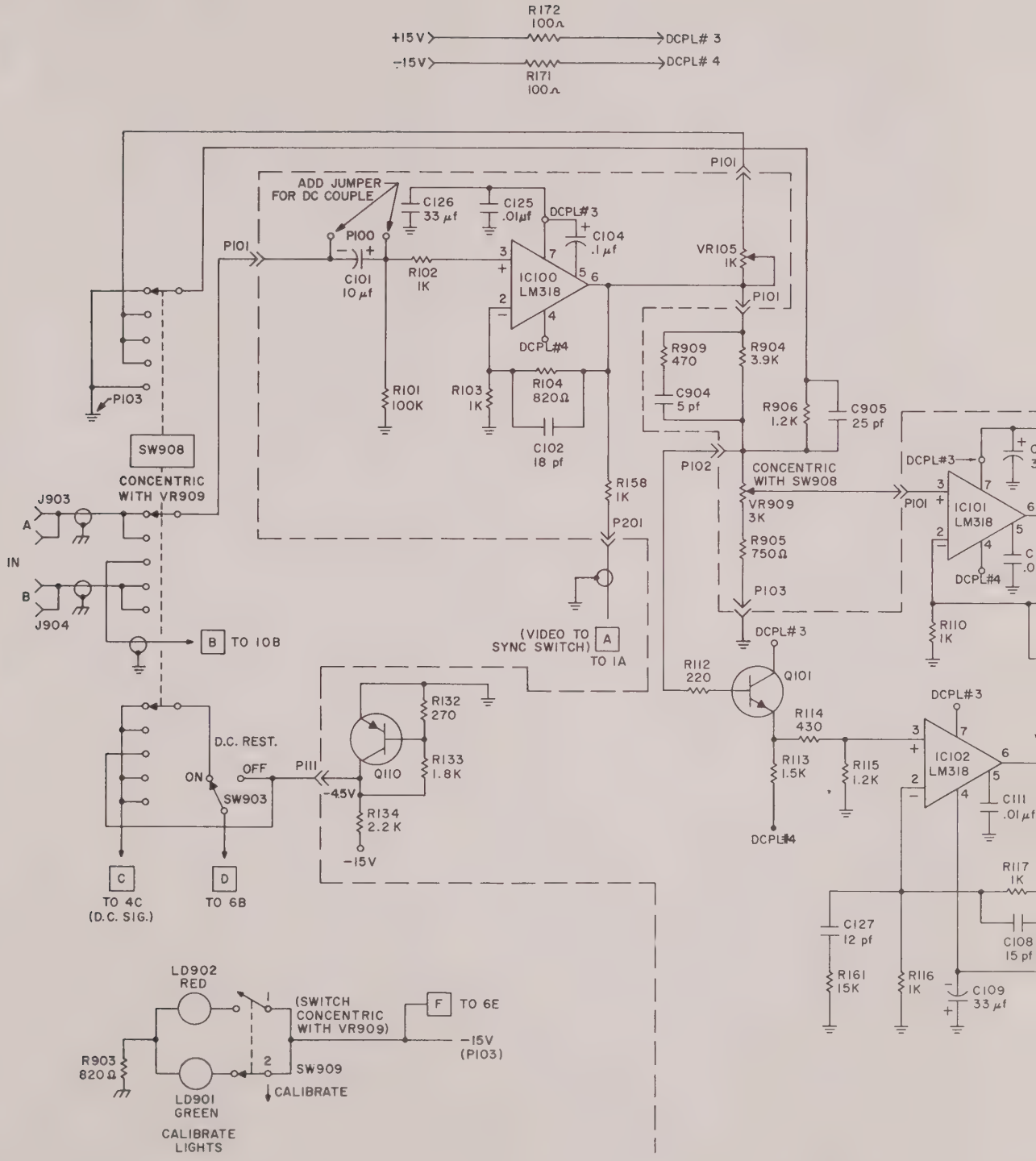
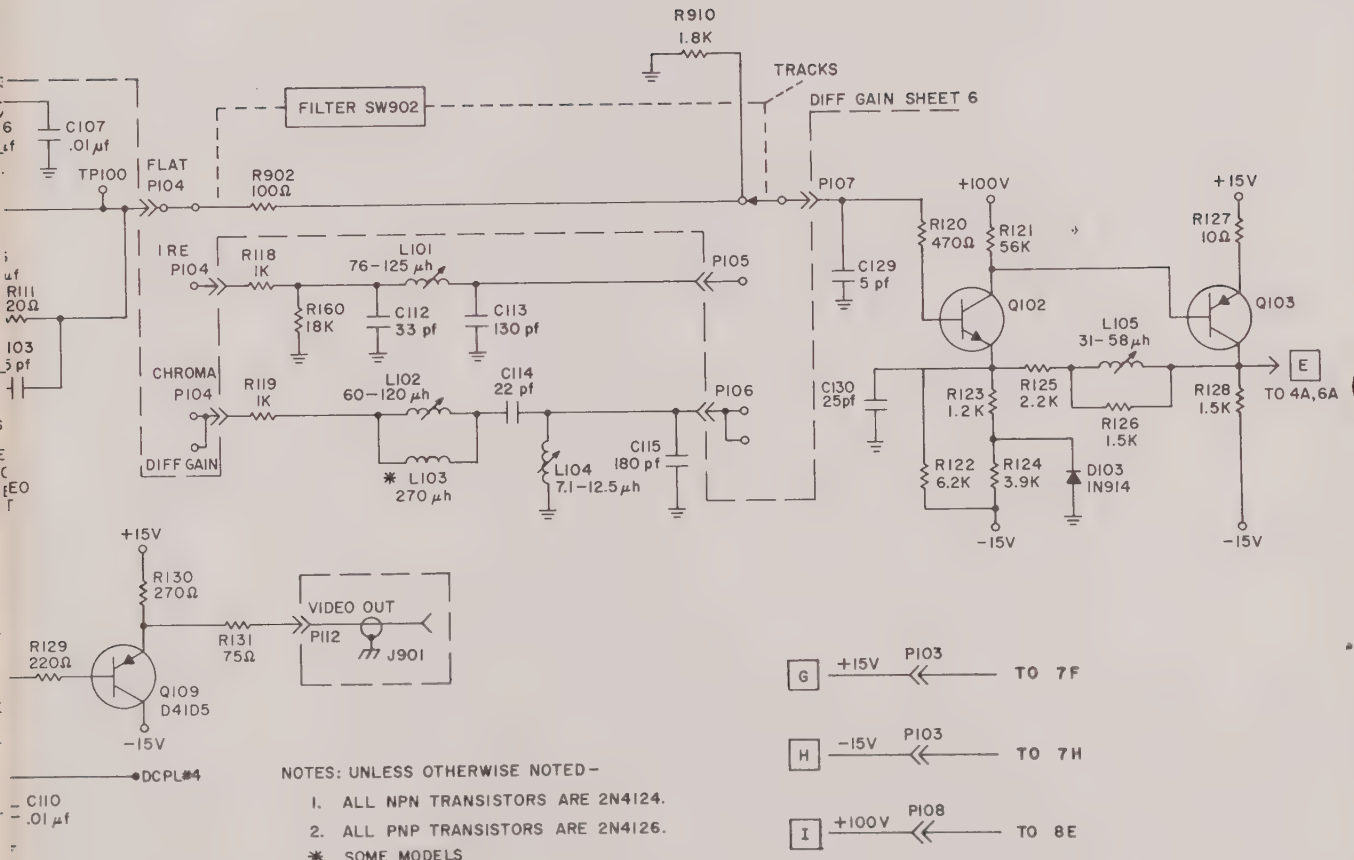
1. ALL NPN TRANSISTORS ARE 2N4124.
2. ALL PNP TRANSISTORS ARE 2N4126.



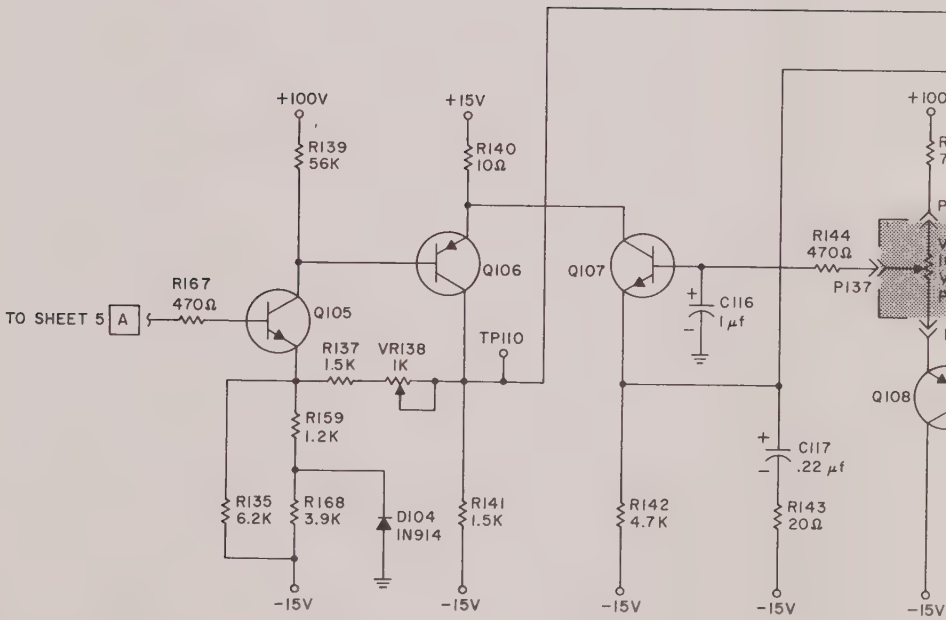
900, 100
WFM
Video Preamp, Filters & Video Out 5



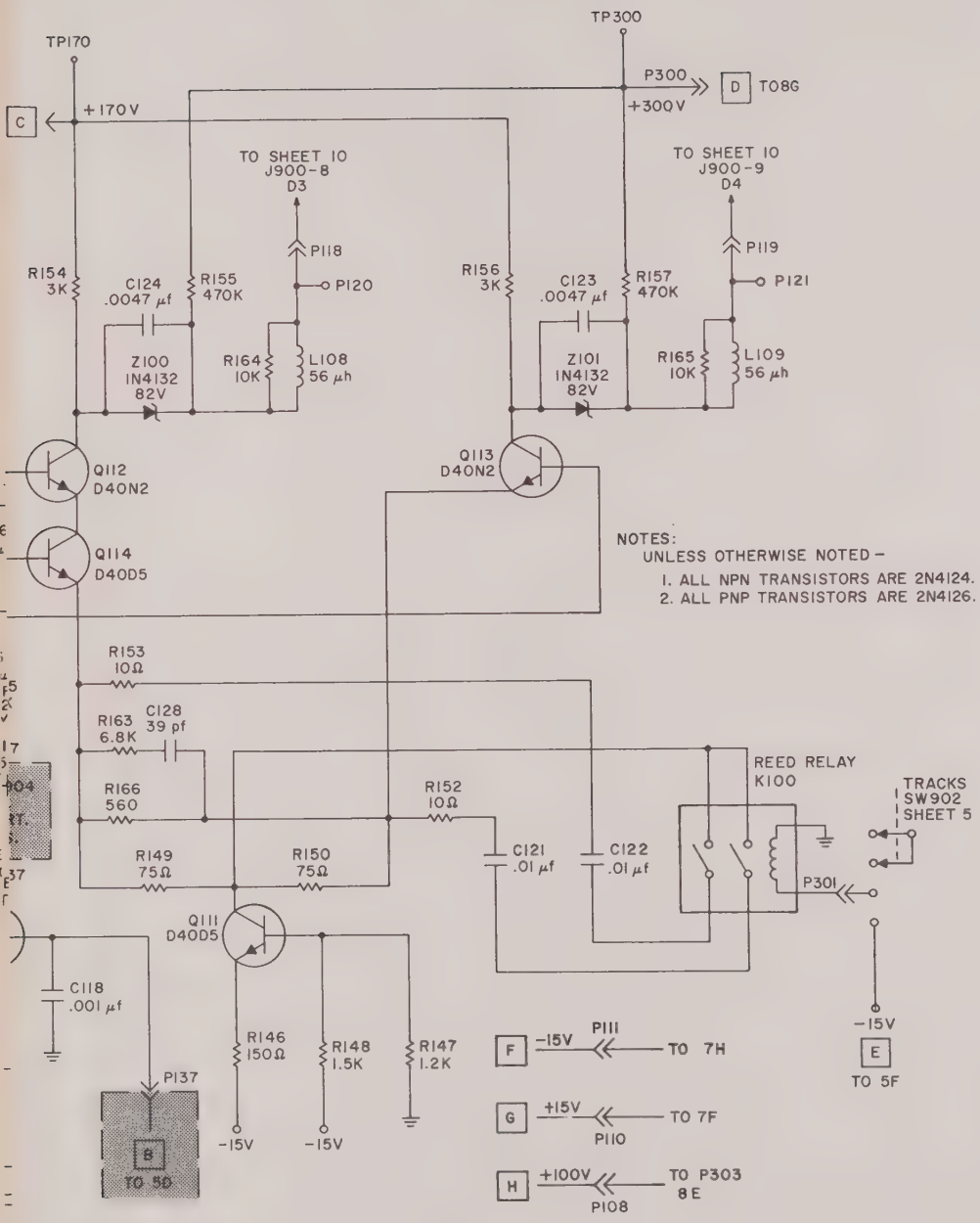
NOTES: UNLESS OTHERWISE NOTED-

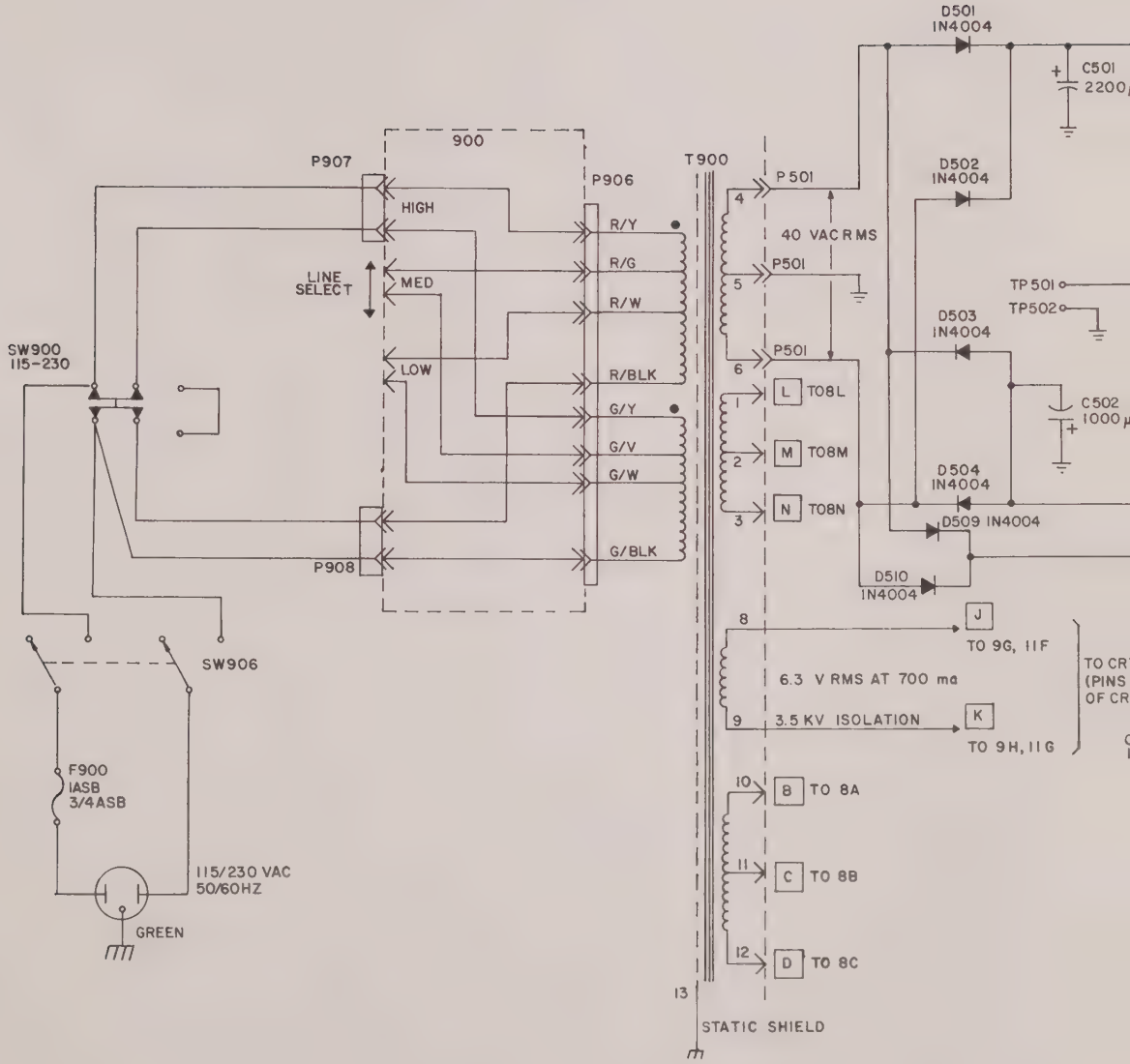
1. ALL NPN TRANSISTORS ARE 2N4124.
2. ALL PNP TRANSISTORS ARE 2N4126.

* SOME MODELS

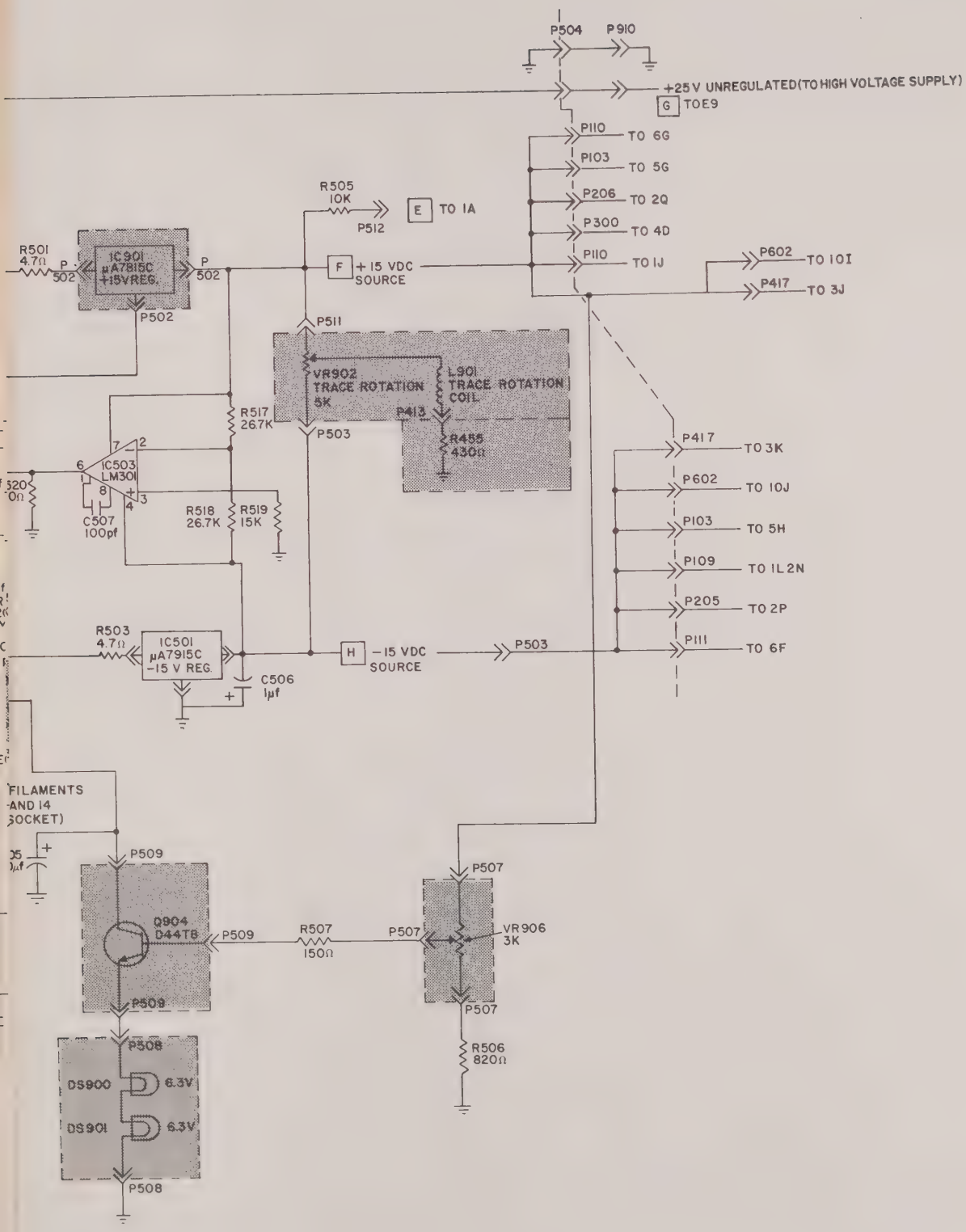


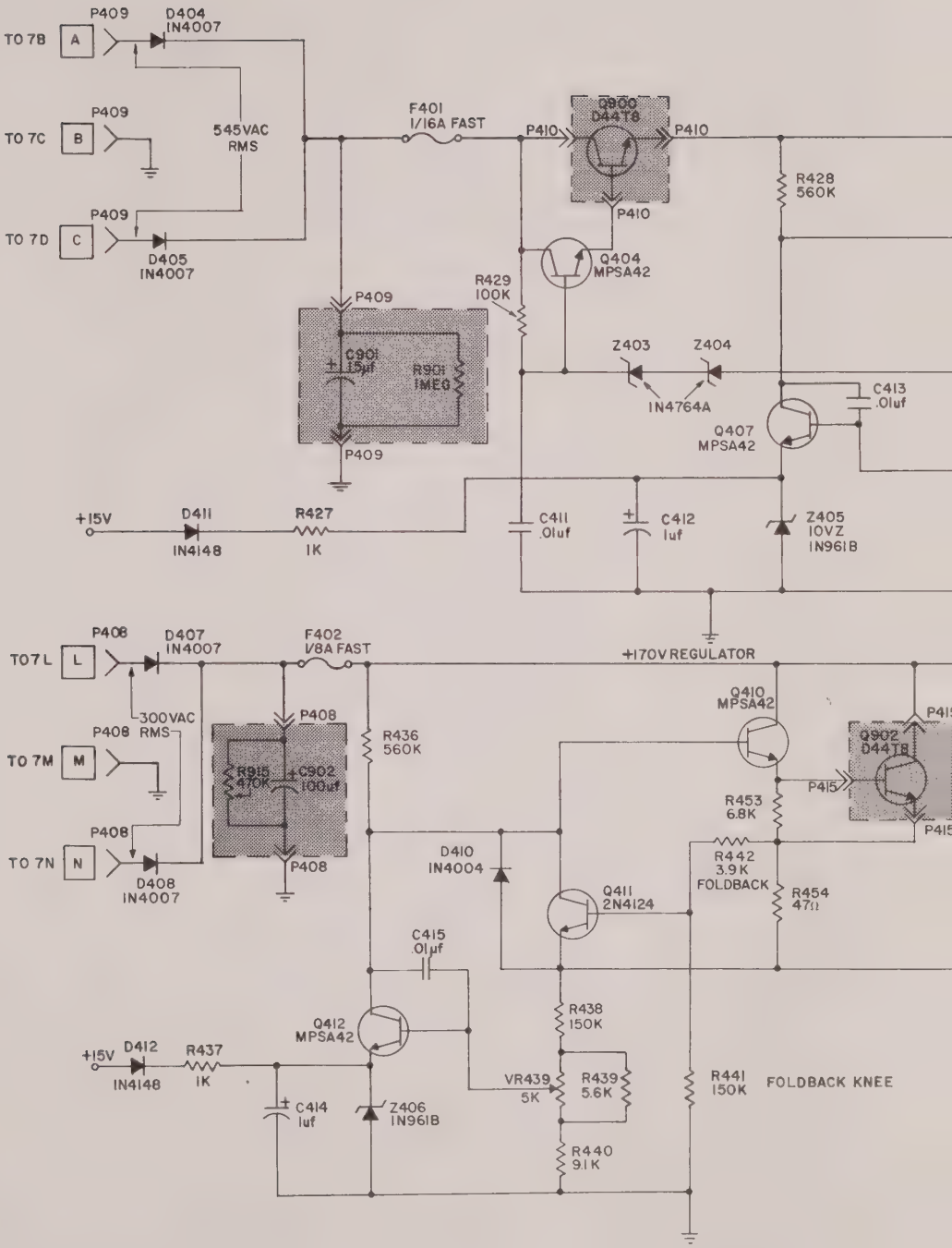
100, 900
WFM
Vert. Deflection 6

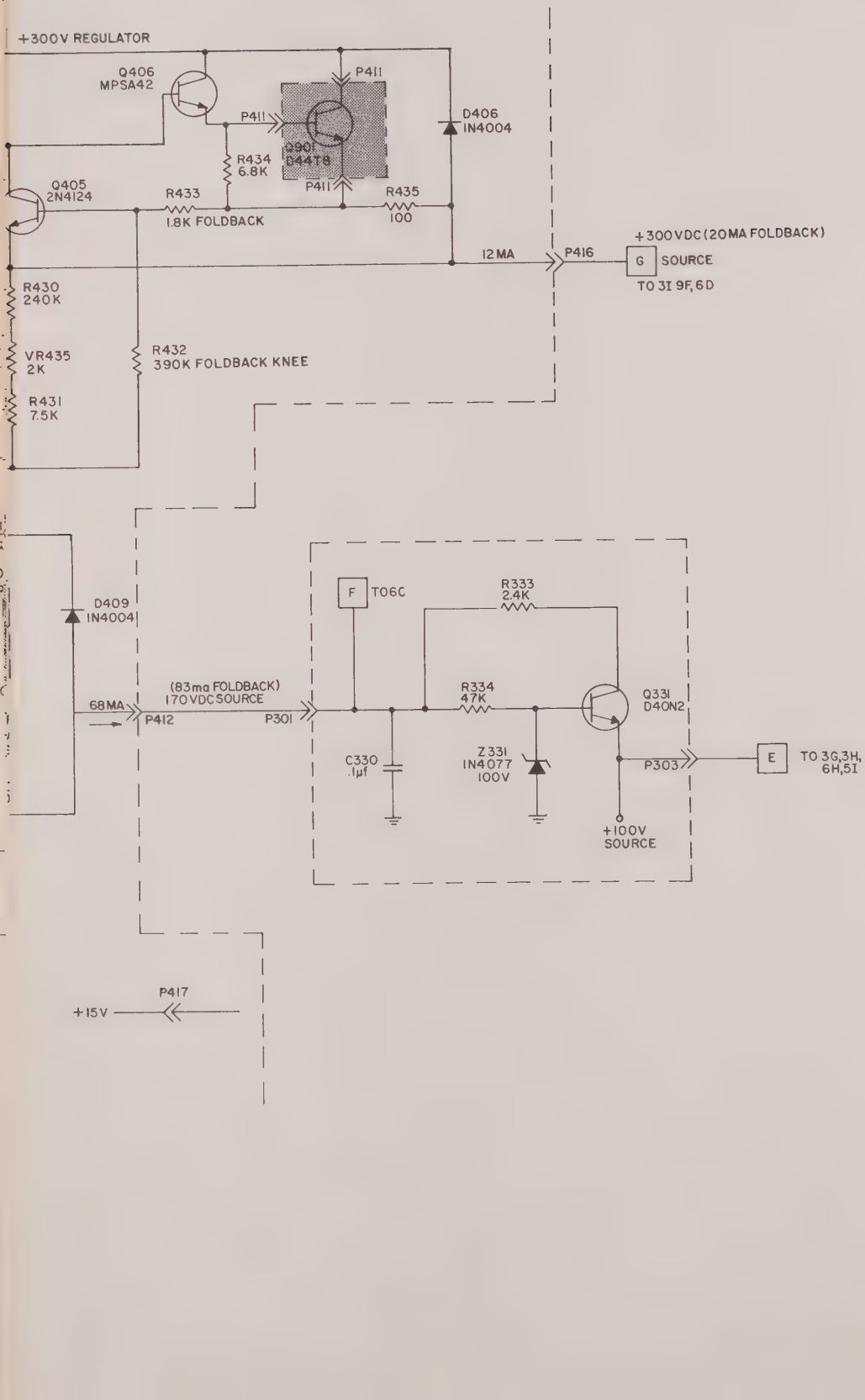

TP170
TP300
P300
D
TO8G
C
+170V
+300V
TO SHEET 10
J900-8
D3
TO SHEET 10
J900-9
D4
P118
P119
R154
3K
C124
.0047 μf
R155
470K
P120
R156
3K
C123
.0047 μf
R157
470K
P121
Z100
IN4132
82V
R164
10K
L108
56 μh
Z101
IN4132
82V
R165
10K
L109
56 μh
Q112
D40N2
Q113
D40N2
Q114
D40D5
NOTES:
UNLESS OTHERWISE NOTED –
1. ALL NPN TRANSISTORS ARE 2N4124.
2. ALL PNP TRANSISTORS ARE 2N4126.
R153
10Ω
R163
6.8K
C128
39 pf
REED RELAY
K100
TRACKS
SW902
SHEET 5
R166
560
R152
10Ω
C121
.01 μf
C122
.01 μf
P301
R149
75Ω
R150
75Ω
Q111
D40D5
C118
.001 μf
R146
150Ω
R148
1.5K
R147
1.2K
-15V
P111
F
TO 7H
G
+15V
TO 7F
P110
H
+100V
TO P303
8E
P108
P137
B
TO 5D
E
TO 5F

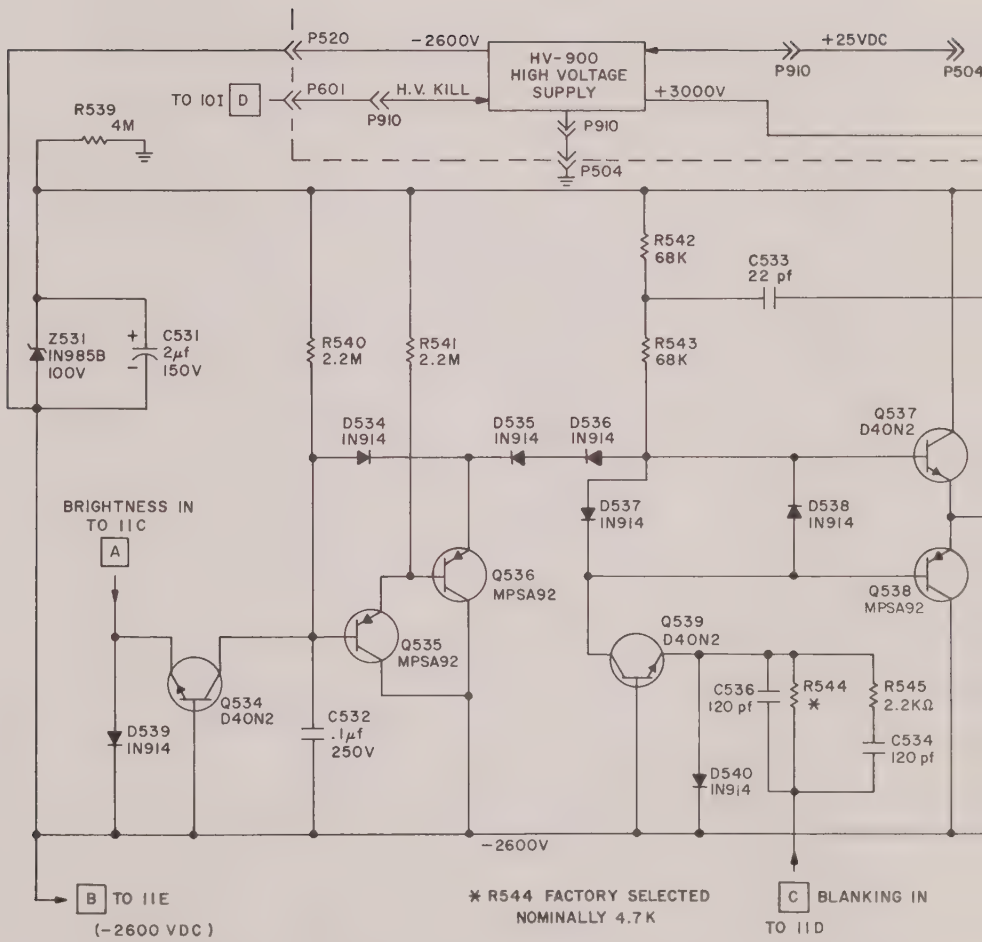


900,500,400
TSM-5
Low Voltage Power Supplies 7

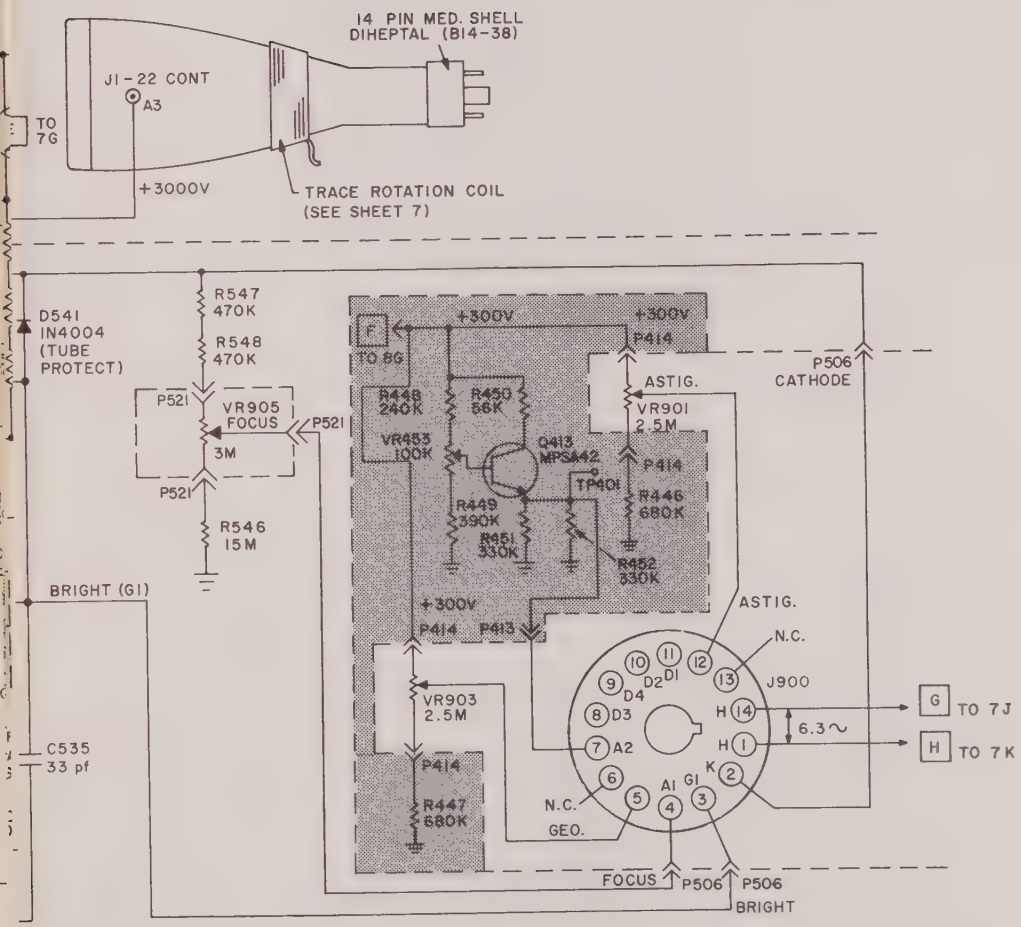

P504
P910
+25 V UNREGULATED (TO HIGH VOLTAGE SUPPLY)
G
TO E9
P110
TO 6G
P103
TO 5G
P206
TO 2Q
P300
TO 4D
P110
TO 1J
P602
TO 10I
P417
TO 3J
R505
10K
P512
E
TO 1A
R501
4.7Ω
P 502
IC901
μA7815C
+15V REG.
P 502
P502
F
+15 VDC
SOURCE
P511
VR902
TRACE ROTATION
5K
L901
TRACE ROTATION
COIL
P413
R455
430Ω
P503
R517
26.7K
IC503
LM301
C507
100pf
R518
26.7K
R519
15K
P417
TO 3K
P602
TO 10J
P103
TO 5H
P109
TO 1L 2N
P205
TO 2P
P111
TO 6F
R503
4.7Ω
IC501
μA7915C
−15 V REG.
C506
1μf
H
−15 VDC
SOURCE
P503
FILAMENTS
AND 14
SOCKET)
P509
Q904
D44T8
P509
R507
150Ω
P507
P507
VR906
3K
P507
R506
820Ω
P509
P508
DS900
6.3V
DS901
6.3V
P508

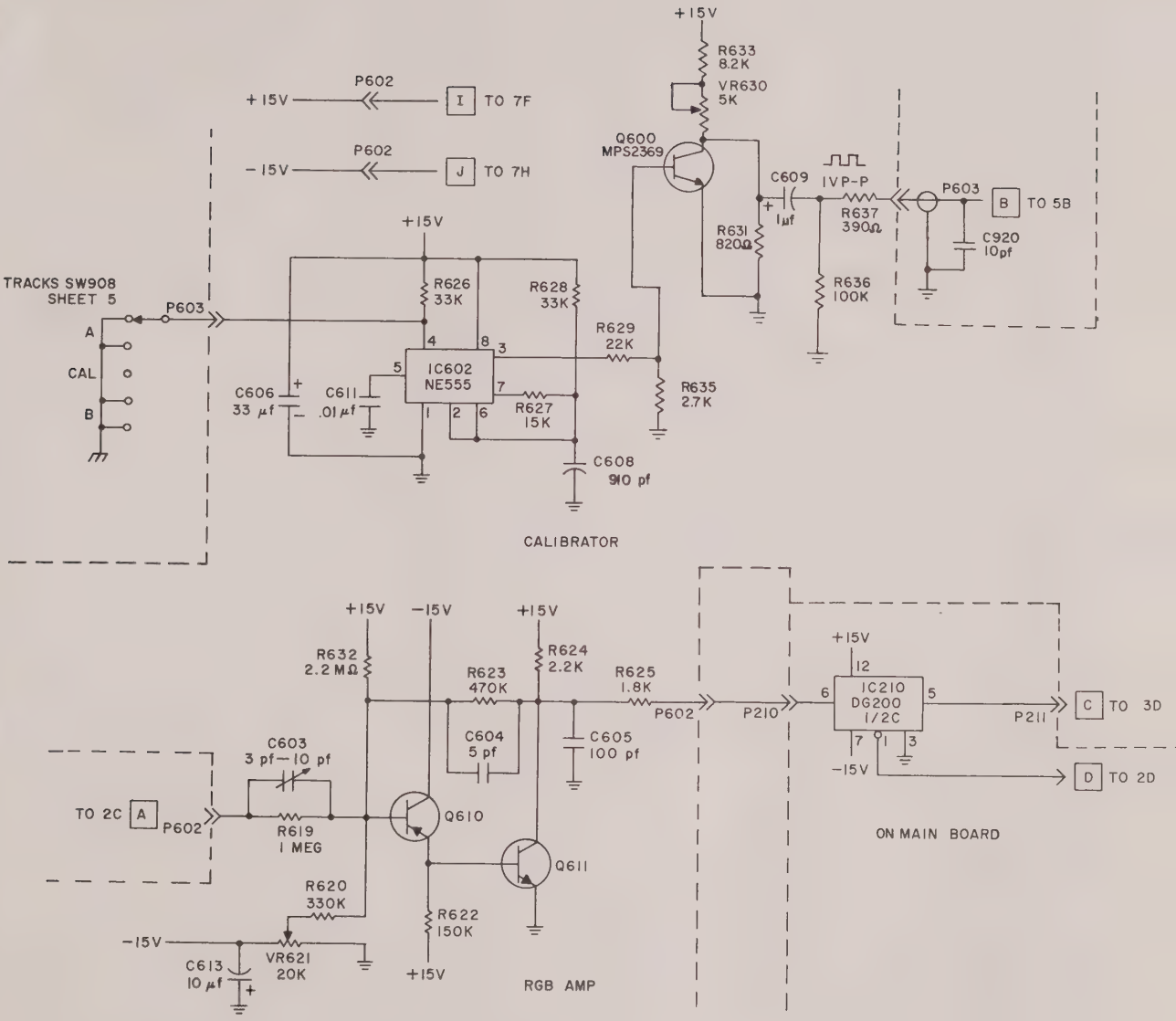

TO 7B
A
P409
D404
IN4007
TO 7C
B
P409
545VAC
RMS
TO 7D
C
P409
D405
IN4007
F401
1/16A FAST
P410
Q900
D44T8
P410
P410
R428
560K
Q404
MPSA42
R429
100K
P409
C901
15µf
R901
1MEG
P409
Z403
Z404
IN4764A
C413
.01uf
Q407
MPSA42
+15V
D411
IN4148
R427
1K
C411
.01uf
C412
1uf
Z405
10VZ
IN961B
+170V REGULATOR
TO 7L
L
P408
D407
IN4007
F402
1/8A FAST
300VAC
RMS
P408
TO 7M
M
P408
R915
470K
C902
100uf
P408
R436
560K
Q410
MPSA42
Q902
D44T8
P415
R453
6.8K
TO 7N
N
P408
D408
IN4007
D410
IN4004
R442
3.9K
FOLDBACK
R454
47Ω
Q411
2N4124
C415
.01µf
R438
150K
Q412
MPSA42
+15V
D412
IN4148
R437
1K
C414
1uf
Z406
IN961B
VR439
5K
R439
5.6K
R441
150K
FOLDBACK KNEE
R440
9.1K


+300V REGULATOR
Q406
MPSA42
P411
P411
D406
IN4004
Q901
D44T8
R434
6.8K
P411
Q405
2N4124
R433
1.8K FOLDBACK
R435
100
+300VDC (20MA FOLDBACK)
12MA
P416
G
SOURCE
TO 31 9F, 6D
R430
240K
VR435
2K
R431
7.5K
R432
390K FOLDBACK KNEE
D409
IN4004
F
TO6C
R333
2.4K
(83ma FOLDBACK)
170 VDC SOURCE
68MA
P412
P301
R334
47K
Q331
D40N2
C330
.1μf
Z331
IN4077
100V
P303
E
TO 3G,3H,
6H,5I
+100V
SOURCE
P417
+15V

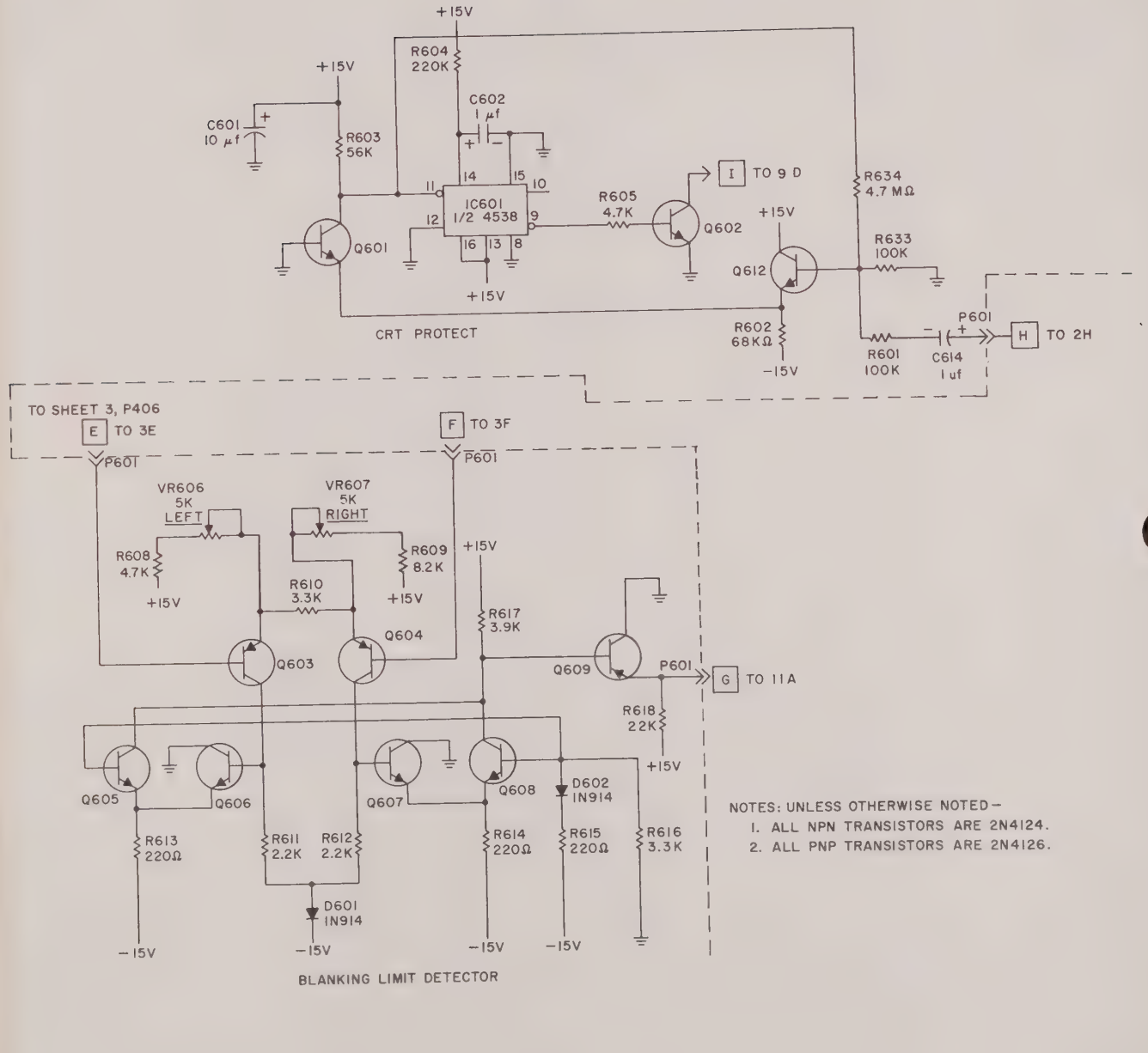


900, 500, 400
TSM-5
Blanking Amp 9

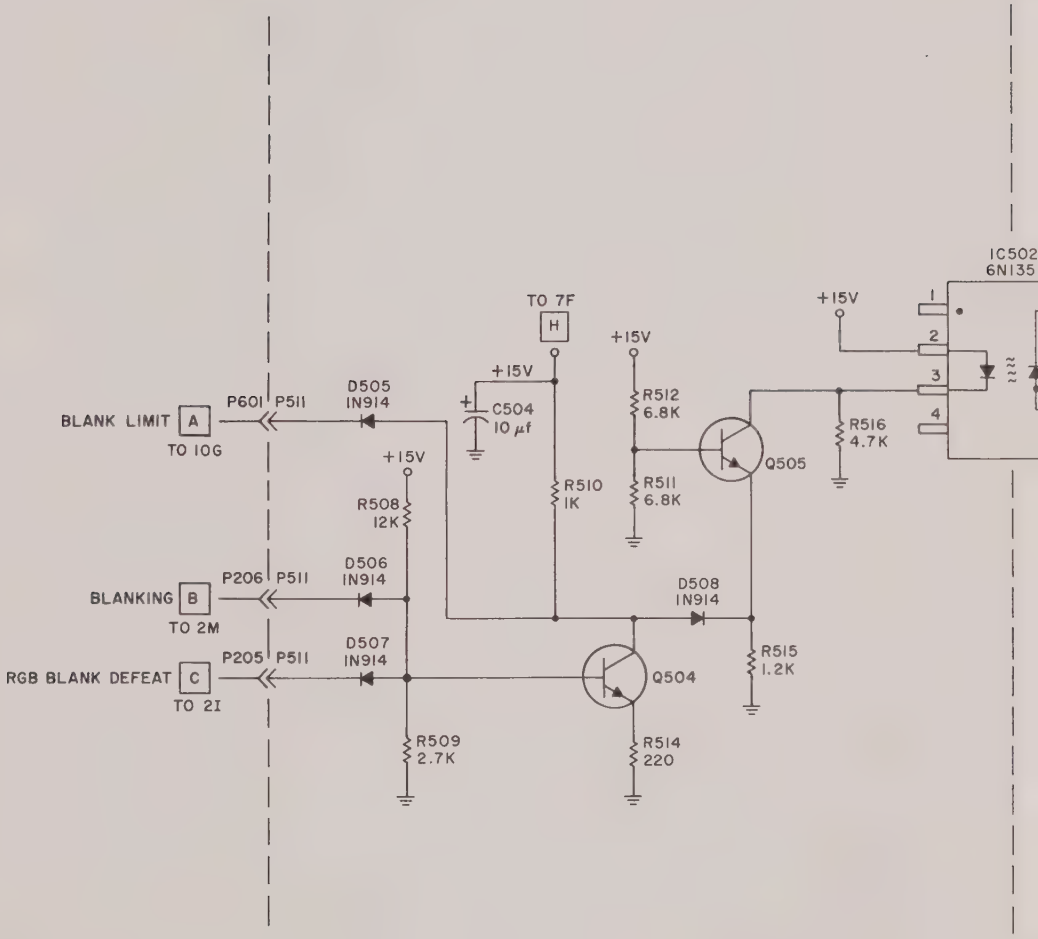

14 PIN MED. SHELL
DIHEPTAL (B14-38)
J1-22 CONT
A3
TO
7G
+3000V
TRACE ROTATION COIL
(SEE SHEET 7)
R547
470K
R548
470K
D541
IN4004
(TUBE
PROTECT)
P521
VR905
FOCUS
3M
P521
P521
R546
15M
BRIGHT (G1)
C535
33 pf
F
TO 8G
+300V
+300V
P414
R448
240K
R450
56K
VR453
100K
Q413
MPS442
TP401
P414
R449
390K
R451
330K
R446
680K
R452
330K
+300V
P414
P413
VR903
2.5M
P414
R447
680K
P506
CATHODE
ASTIG.
VR901
2.5M
ASTIG.
N.C.
J900
D2
D1
D4
D3
A2
A1
G1
K
N.C.
GEO.
H 14
H 1
6.3~
G
TO 7J
H
TO 7K
FOCUS
P506
P506
BRIGHT



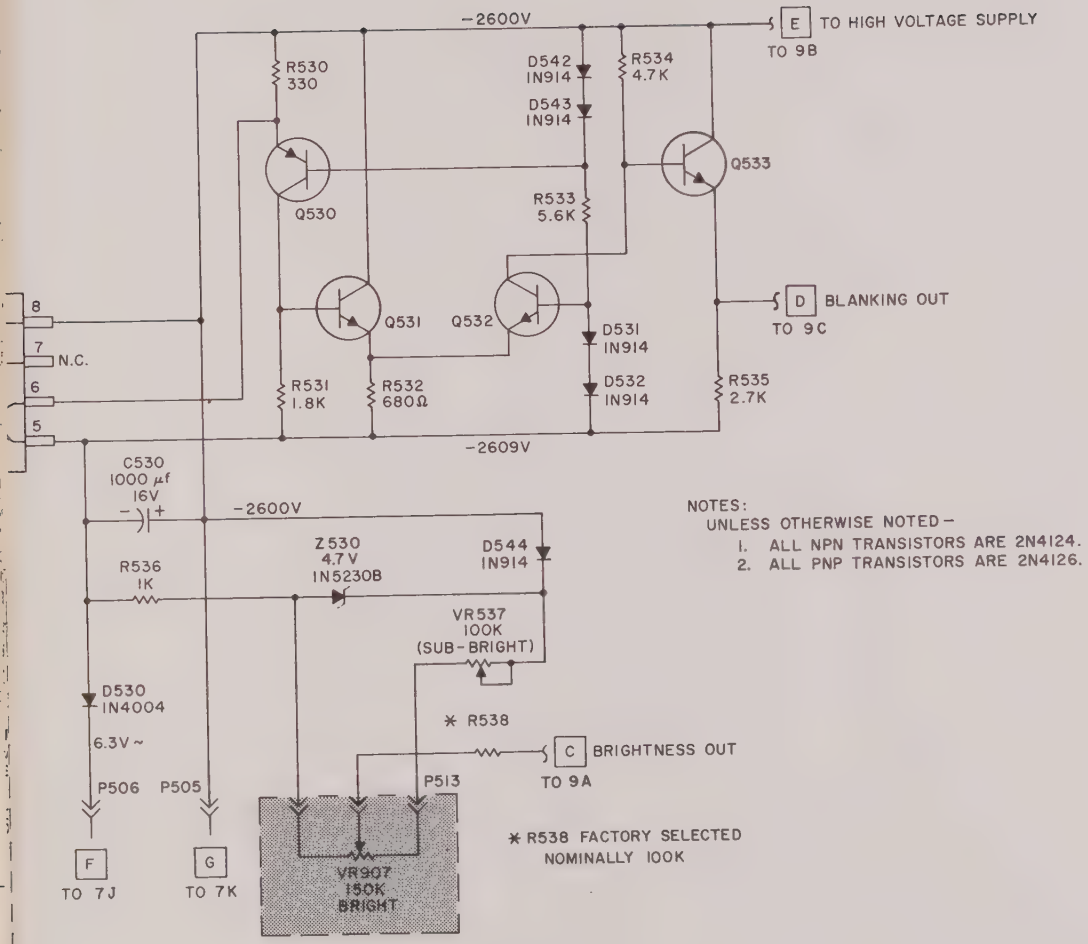
600
TSM-5
Calibrator, CRT Protect, RGB, Blanking Limit 10



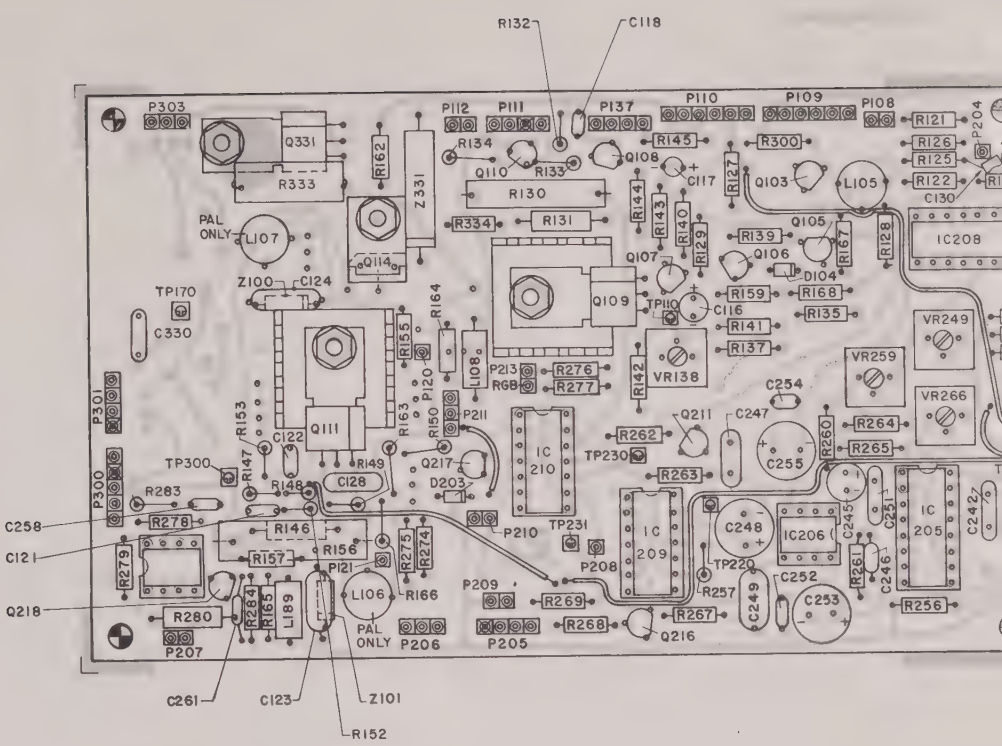
NOTES: UNLESS OTHERWISE NOTED—
1. ALL NPN TRANSISTORS ARE 2N4124.
2. ALL PNP TRANSISTORS ARE 2N4126.

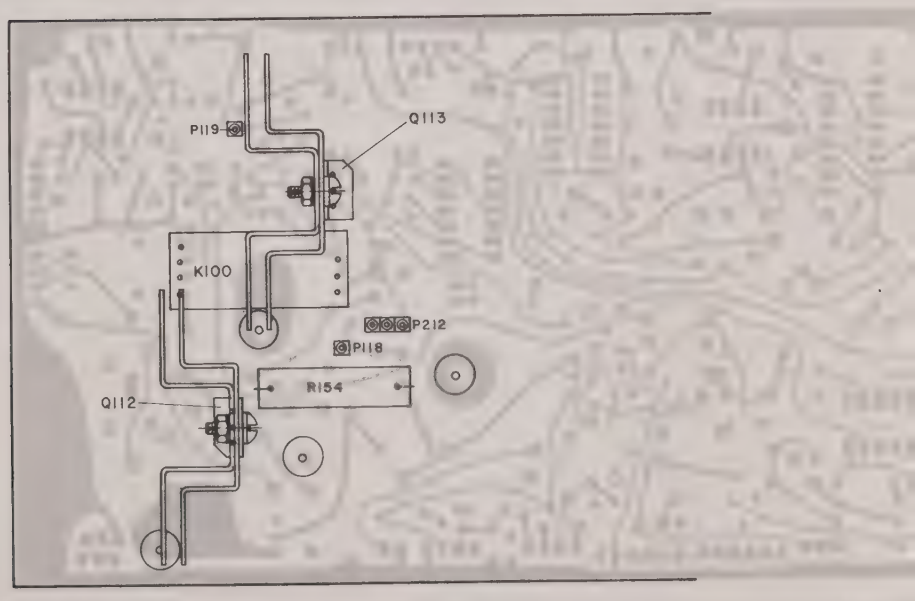


900, 500
WFM
Blanking Opto-Coupler II

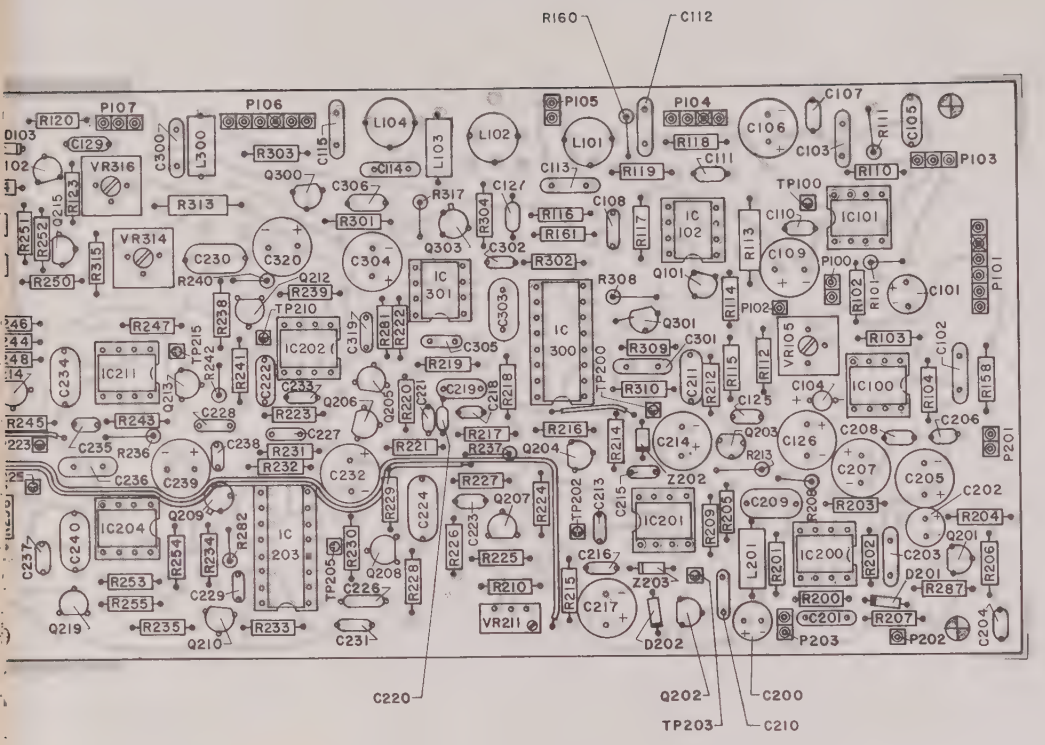


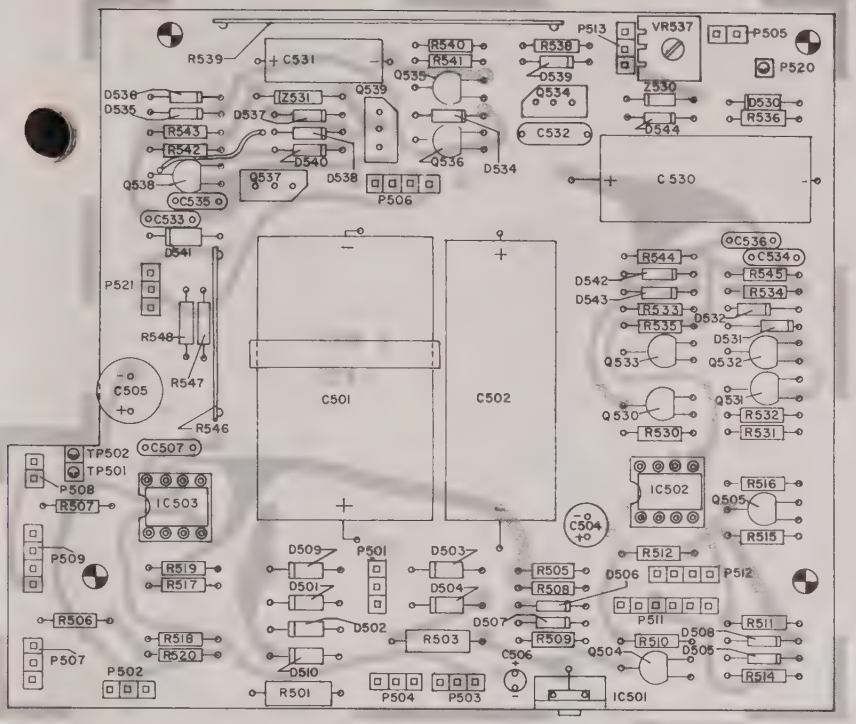
NOTES:
UNLESS OTHERWISE NOTED –
1. ALL NPN TRANSISTORS ARE 2N4124.
2. ALL PNP TRANSISTORS ARE 2N4126.





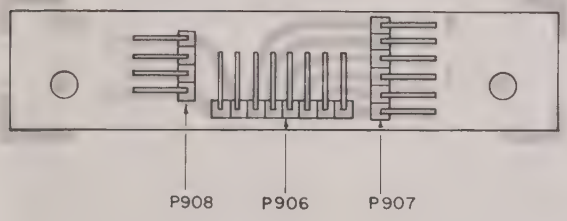
TSM-5 Main Board, Signal Processing
Series 100, 200, 300 Designators


R160
C112
P105
P104
C107
P107
P106
L104
L103
L102
L101
C106
C103
P103
R120
C129
VR316
R303
C115
C114
L300
C300
Q300
C306
R313
R317
C127
R304
R116
R161
C108
R117
IC 102
C110
TP100
IC101
R111
C105
R110
R119
C111
C113
R118
VR314
C230
C320
C304
R240
Q212
R239
R301
Q303
C302
R302
IC 301
R308
Q301
IC 300
TP200
R309
C301
R310
Q101
R113
C109
R114
P100
P102
R102
R101
C101
P101
R103
C102
R104
R158
P201
C104
IC100
C206
C208
C125
C126
C207
C205
C202
R204
Q201
C203
D201
R287
R206
R207
C204
P202
P203
R200
C201
R202
IC200
L201
R201
C209
R205
R209
IC201
Z202
C214
Q203
R213
R214
C213
C215
TP202
C216
Z203
C217
D202
VR211
R215
R210
C223
R225
R226
C224
R227
R229
Q207
R224
Q204
R216
R217
R237
C218
C219
C221
R220
Q205
C222
R221
C232
C233
Q206
R223
C227
R231
R232
C238
C239
R236
C235
C236
R243
C228
R247
R238
TP210
R242
TP215
R241
IC202
C319
R281
R222
C305
R219
C303
C2349
IC211
Q213
R245
C223
C240
C237
IC204
Q209
R282
IC 203
R254
R234
R253
R255
Q219
Q210
R235
R233
C229
TP205
R230
C226
Q208
R228
C231
C220
Q202
TP203
C210
C200

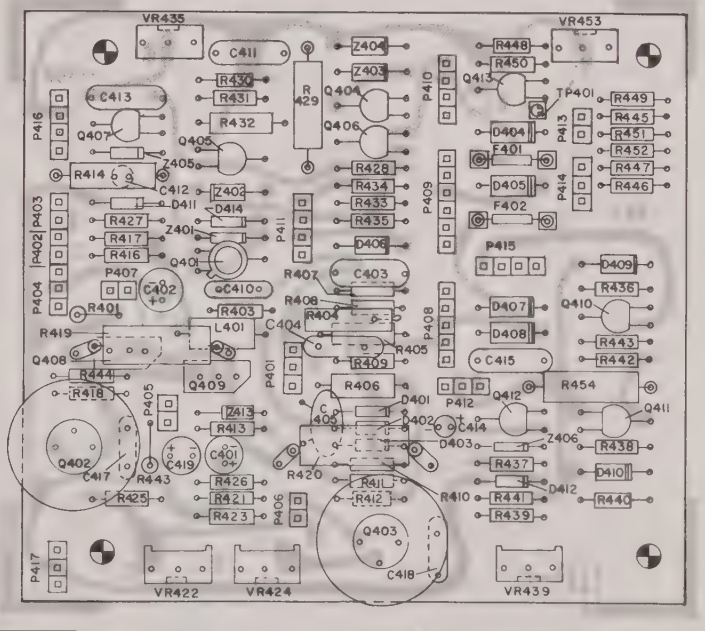


TSM-5 CRT Interface, Blanking, Low Power Supply

Series 500 Designators

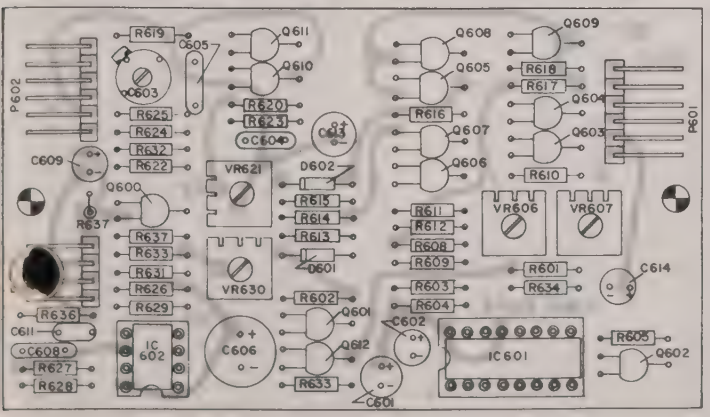


TSM-5 900 Board



TSM-5 Sweep, Medium Voltage Supply

Series 400 Designators



TSM-5 RGB, Calibration, Blanking Limits

Series 600 Designators

Electrical Parts List

DESIG-NATOR	VIDEOTEK PART NO.	DESCRIPTION	MFGR. CODE	MFGR. PT. NO.
		CAPACITORS		
C101	CR-100-2I	ELCTLT, 10uf, 25V, Radial	1301	KSET 10-25
C102	CM-180-6P	Mica, 18pf, 2%	1301	DM1518G
C103	CM-150-6P	Mica, 15pf, 2%	1301	DM1515G
C104	CT-104-3J	Tantalum, .1uf, 35V	1402	196D104X9035HAI
C105	CF-473-4P	Foil, .047uf, 100V	1401	PD47K
C106	CR-330-2J	ELCTLT, 33uf, 35V, Radial	1301	KSET33-35
C107	CF-103-4P	Foil, .01uf, 100V	1401	PD10K
C108	CM-150-6P	Mica, 15pf, 2%	1301	DM1515G
C109	CR-330-2J	ELCTLT, 33uf, 35V, Radial	1301	KSET33-35
C110	CR-103-4P	Foil, .01uf, 100V	1401	PK10K
C111	CF-103-4P	Foil, .01uf, 100V	1401	PD10K
C112	CM-330-6P	Mica, 33pf, 2%	1301	DM1533G
C113	CM-131-6P	Mica, 130pf, 2%	1301	DM15130G
C114	CM-220-6P	Mica, 22P, 2%	1301	DM1522G
C114	CM-180-6P	Mica, 18pf, 2% (PAL)	1301	DM1518G
C115	CM-181-6P	Mica, 180pf, 2%	1301	DM15180G
C115	CM-121-6P	Mica, 120pf, 2% (PAL)	1301	DM15120G
C116	CR-109-2L	ELCTLT, 1uf, 50V, Radial	1301	KSET1-50
C117	CT-224-3J	Tantalum, .22uf, 35V	1402	196D224X9035HAI
C118	CF-102-4P	Foil, .001uf, 100V	1401	PD1K
C121	CF-103-4P	Foil, .01uf, 100V	1401	PD10K
C122	CF-103-4P	Foil, .o1uf, 100V	1401	PD10K
C123	CF-472-4P	Foil, .0047uf, 100V	1401	PD47K
C124	CF-472-4P	Foil, .0047uf, 100V	1401	PD47K
C125	CF-103-4P	Foil, .01uf, 100V	1401	PD10K
C126	CR-330-2J	ELCTLT, 33uf, 35V, Radial	1301	KSET33-35
C127	CM-120-6P	Mica, 12pf, 2%	1301	DM1512G
C128	CM-390-6P	Mica, 39pf, 2%	1301	DM1539G
C129	CM-509-6P	Mica, 5pf, 2%	1301	DM155G
C130	CM-250-6P	Mica, 25pf, 2%	1301	DM1525G
C200	CR-100-2I	ELCTLT, 10uf, 25V Radial	1301	KSET10-25
C201	CM-330-6P	Mica, 33pf, 2%	1301	DM1533G
C202	CR-100-2I	ELCTLT, 10uf, 25V, Radial	1301	KSET10-25
C203	CM-470-6P	Mica, 47pf, 2%	1301	DM1547G
C204	CF-103-4P	Foil, .01uf, 100V	1401	PD10K
C205	CR-330-2J	ELCTLT, 33uf, 35V, Radial	1301	KSET33-35
C206	CF-103-4P	Foil, .01uf, 100V	1401	PD10K
C207	CR-330-2J	ELCTLT, 33uf, 35V, Radial	1301	KSET33-35
C208	CF-103-4P	Foil, .01uf, 100V	1401	PK10K
C209	CF-104-4P	Foil, .1uf, 100V	1401	PD100K
C210	CM-150-6P	Mica, 15pf, 2%	1301	DM1515G
C210	CM-110-6P	Mica, 11pf, 2% (PAL)	1301	DM1511G
C211	CF-473-4P	Foil, .047uf, 100V	1401	PD47K
C213	CF-103-4P	Foil, .01uf, 100V	1401	PD10K
C214	CR-330-2J	ELCTLT, 33uf, 35V, Radial	1301	KSET33-35
C215	CF-103-4P	Foil, .01uf, 100V	1401	PD10K
C216	CF-103-4P	Foil, .01uf, 100V	1401	PD10K
C217	CR-330-2J	ELCTLT, 33uf, 35V, Radial	1301	KSET33-35
C218	CF-472-4P	Foil, .0047uf, 100V	1401	PD4.7K
C219	CF-473-4P	Foil, .047uf, 100V	1401	PD47K
C220	CF-102-4P	Foil, .001uf, 100V	1401	PD1K
C221	CF-102-4P	Foil, .001uf, 100V	1401	PD1K
C222	CF-473-4P	Foil, .047uf, 100V	1401	PD47K
C223	CF-472-4P	Foil, .0047uf, 100V	1401	PD4.7K
C224	CF-104-4P	Foil, .1uf, 100V	1401	PD100K
C226	CM-101-6P	Mica, 100pf, 2%	1301	DM15100G
C227	CM-121-6P	Mica, 120pf, 2%	1301	DM15120G
C228	CM-101-6P	Mica, 100pf, 2%	1301	DM15100G
C229	CF-102-4P	Foil, .001uf, 100V	1401	PD1K
C230	CR-104-4P	Foil, .1uf, 100V	1401	PD100K
C231	CF-103-4P	Foil, .01uf, 100V	1401	PD10K
C232	CR-330-2J	ELCTLT, 33uf, 35V, Radial	1301	KSET33-35
C233	CF-103-4P	Foil, .01uf, 100V	1401	PD10K
C234	CF-104-4P	Foil, .1uf, 100V	1401	PD100K
C235	CF-103-4P	Foil, .01uf, 100V	1401	PD10K
C236	CM-471-6P	Mica, 470pf, 2%	1301	DM15470G
C237	CF-103-4P	Foil, .01uf, 100V	1401	PD10K
C238	CF-103-4P	Foil, .01uf, 100V	1401	PD10K
C239	CR-330-2J	ELCTLT, 33uf, 35F, Radial	1301	KSET33-35
C240	CF-104-4P	Foil, .1uf, 100V	1401	PD100K
C242	CM-200-6P	Mica, 20pf, 2%	1301	DM1520G
C245	CR-100-2J	ELCTLT, 10uf, 35V, Radial	1301	KSET10-35
C246	CF-103-4P	Foil, .01uf, 100V	1401	PD10K
C247	CM-102-6P	Mica, 100pf, 2%	1301	DM151000G
C248	CR-330-2L	ELCTLT, .33uf, 50V, Radial	1301	KSET33-35
C249	CF-104-4P	Foil, .1uf, 100V	1401	PD100K
C251	CM-200-6P	Mica, 20pf, 2%	1301	DM1520G
C252	CF-103-4P	Foil, .01uf, 100V	1401	PD10K
C253	CR-330-2J	ELCTLT, 33uf, 35V, Radial	1301	KSET33-35
C254	CF-103-4P	Foil, .01uf, 100V	1401	PD10K
C255	CR-330-2J	ELCTLT, 33uf, 35V, radial	1301	KSET33-35
C258	CF-102-4P	Foil, .001uf, 100V	1401	PK1K
C300	CM-150-6P	Mica, 15pf, 2%	1301	DM1515G
C300	CM-110-6P	Mica, 11pf, 2% (PAL)	1301	DM1511G
C301	CM-620-6P	Mica, 62pf, 2%	1301	DM1562G
C302	CF-102-4P	Foil, .001uf, 100V	1401	PK1K
C303	CF-104-4P	Foil, .1uf, 100V	1401	PK100K
C304	CR-330-2J	ELCTLT, 33uf, 35V, Radial	1301	KSET33-35
C305	CF-103-4P	Foil, .01uf, 100V	1401	PD10K
C306	CM-100-6P	Mica, 10pf, 2%	1301	DM1510G
C319	CF-103-4P	Foil, .01uf, 100V	1401	PD10K
C320	CR-330-2J	ELCTLT, 33uf, 35V, Radial	1301	KSET33-35
C330	CP-104-4R	Metalized Polyester .1uf, 250V, ±10%	1301	280AE/A100K
C401	CR-100-2I	ELCTLT, 10uf, 25V, Radial	1301	KSET10-25
C402	CR-100-2I	ELCTLT, 10uf, 25V, Radial	1301	KSET10-25
C403	CP-102-4R	Metalized Polyester .001uf, 250V, ±10%	1301	C280AE/A1K
C404	CP-102-4R	Metalized Polyester .001uf, 250V, ±10%	1301	C280AE/A1K
C405	CP-103-4R	Metalized Polyester .01uf, 250V, ±10%	1301	C280AE/A10K
C410	CM-390-6P	Mica, 30pf, 2%	1301	DM1539G
C411	CP-103-4T	Metalized film, .01, 400V, ±10%	1301	C280AF/A10K
C412	CT-105-3J	Tantalum, 1uf	1402	196D104X9035HAI
C413	CP-103-4T	Metalized film, .01, 400V, ±10%	1301	C280AF/A10K
C414	CT-105-3J	Tantalum, 1uf	1402	196D104X9035HAI
C415	CP-103-4T	Metalized film, .01, 400V, ±10%	1301	C280AF/A10K
C417	CM-150-6P	Mica, 15pf, 2%	1301	DM1515G
C418	CM-150-6P	Mica, 15pf, 2%	1301	DM1515G
C419	CR-100-2I	ELCTLT, 10uf, 25V, Radial	1301	KSET10-25
C501	CX-222-2K	ELCTLT, 2200uf, 40V	1301	KCA-2200-40
C502	CX-102-2K	ELCTLT, 1000uf, 40V	1301	KCA-1000-40
C504	CR-100-2I	ELCTLT, 10uf, 25V, Radial	1301	KSET10-25
C505	CR-101-2J	ELCTLT, 100uf, 35V, Radial	1301	KSET100-35
C506	CT-105-3J	Tantalum, 1uf	1402	196D104X9035HAI
C507	CM-101-6P	Mica, 100pf, 2%	1301	DM15100G
C530	CX-102-2G	ELCTLT, 1000uf, 16V	1301	KCA1000-16
C531	CX-209-2Q	ELCTLT, 2uf, 150V	1404	NLW2-150
C532	CP-104-4R	Metalized Polyester .1uf, 250V, ±10%	1301	280AE/A100K
C533	CM-220-6P	Mica, 22pf, 2%	1301	DM1522G
C534	CM-121-6P	Mica, 120pf, 2%	1301	DM15120G
C535	CM-330-6P	Mica, 33pf, 2%	1301	DM1533G
C536	CM-121-5)6P	Mica, 120pf, 2%	1301	DM15120G
C601	CR-100-2I	ELCTLT, 10uf, 25V, Radial	1301	KSET10-25
C602	CR-109-2I	ELCTLT, 1uf, 25V, Radial	1301	KSET1-25
C603	CS-010-0I	VAR, TRMR, 3pf-10pf	1301	808-00018
C604	CM-500-6P	Mica, 5pf, 2%	1301	DM105G
C605	CM-101-6P	Mica, 100pf, 2%	1301	DM15100G
C606	CR-330-2J	ELCTLT, 33uf, 25V, Radial	1301	KSET33-25
C608	CM-911-6P	Mica, 910pf, 2%	1301	DM15910G
C609	CR-109-2I	ELCTLT, 1uf, 25V, Radial	1301	KSET1-25
C611	CF-103-4P	Foil, .01uf, 100V	1401	PD10K
C613	CR-100-2I	ELCTLT, 10uf, 25V, Radial	1301	KSET10-25
C614	CR-100-2I	ELCTLT, 1uf, 25V, Radial	1301	KSET1-25
C901	CS-010-06	ELCTLT, 15uf, 450V	1403	KCA-15-450
C902	CS-010-05	ELCTLT, 100uf, 350V	1403	KCA-100-350
C904	CM-500-6P	Mica, 5pf, 2%	1301	DM105G
C905	CM-250-6P	Mica, 25pf, 2%	1301	DM1525G
C920	CM-100-6P	Mica, 10pf, 2%	1301	DM1010G
		DIODES		
D103	DS-914-00	Signal	1301	1N914
D104	DS-914-00	Signal	1301	1N914
D201	DS-914-00	Signal	1301	1N914
D202	DS-914-00	Signal	1301	1N914
D203	DS-914-00	Signal	1301	1N914
D401	DS-914-00	Signal	1301	1N914
D402	DS-914-00	Signal	1301	1N914
D403	DS-914-00	Signal	1301	1N914
D404	DR-400-70	Rectifier, 1000PRV	1301	1N4007
D405	DR-400-70	Rectifier, 1000PRV	1301	1N4007
D406	DR-400-40	Rectifier	1301	1N4004
D407	DR-400-70	Rectifier, 1000PRV	1301	1N4007
D408	DR-400-70	Rectifier, 1000PRV	1301	1N4007
D409	DR-400-40	Rectifier	1301	1N4004
D410	DR-400-40	Rectifier	1301	1N4004
D411	DS-914-00	Signal	1301	1N914
D412	DS-914-00	Signal	1301	1N914
D414	DS-402-00	Multi-pellet	1101	MPD402
D501	DR-400-40	Rectifier	1101	1N4004
D502	DR-400-40	Rectifier	1101	1N4004
D503	DR-400-40	Rectifier	1301	1N4004
D504	DR-400-40	Rectifier	1301	1N4004
D505	DS-914-00	Signal	1301	1N914
D506	DS-914-00	Signal	1301	1N914
D507	DS-914-00	Signal	1301	1N914
D508	DS-914-00	Signal	1301	1N914
D509	DR-400-40	Rectifier	1301	1N4004
D510	DR-400-40	Rectifier	1301	1N4004
D530	DR-400-40	Rectifier	1301	1N4004
D531	DS-914-00	Signal	1301	1N914
D532	DS-914-00	Signal	1301	1N914
D534	DS-914-00	Signal	1301	1N914
D535	DS-914-00	Signal	1301	1N914
D536	DS-914-00	Signal	1301	1N914
D537	DS-914-00	Signal	1301	1N914

DESIG-NATOR	VIDEOTEK PART NO.	DESCRIPTION	MFGR. CODE	MFGR. PT. NO.
		DIODES		
D538	DS-914-00	Signal	1301	1N914
D539	DS-914-00	Signal	1301	1N914
D540	DS-914-00	Signal	1301	1N914
D541	DR-400-40	Rectifier	1301	1N4004
D542	DS-914-00	Signal	1301	1N914
D543	DS-914-00	Signal	1301	1N914
D544	DS-914-00	Signal	1301	1N914
D601	DS-914-00	Signal	1301	1N914
D602	DS-914-00	Signal	1301	1N914
D901	DK-010-01	LED, Green	1203	558-0201-001
D902	DK-010-02	LED, Red	1203	558-0101-001
D903	DS-402-00	Multi-pellet	1101	MPD402
		LAMPS		
DS-900	L1-010-02	Incandescent, 6.3V	1701	CM379
DS-901	L1-010-02	Incandescent, 6.3V	1701	CM379
		FUSES		
F401	F2-761-16	1/16A, Fast	2702	276.062
F402	F2-760-18	1/8A, Fast	2702	276.125
F900	FM-DL1-00	1, Slow	2701	MDL1
F900	FM-DLO-34	3/4, Slow (230V)	2701	MDL3/4
		HIGH VOLTAGE		
HV-900	HS-010-03	High Voltage supply	6001	HV-900
		INTEGRATED CIRCUITS		
IC100	UP-318-NO	OP AMP	1001	LM318N
IC101	UP-318-NO	OP AMP	1001	LM318N
IC102	UP-318-NO	OP AMP	1001	LM318N
IC200	UP-318-NO	OP AMP	1001	LM318N
IC201	UP-318-NO	OP AMP	1001	LM318N
IC202	UP-555-OO	Timer	1002	NE555
IC203	UT-453-8B	Dual Precision Single Shot	1003	MC14538B
IC204	UT-555-00	Timer	1002	NE555
IC205	UT-452-8B	Dual Single Shot	1003	MC14528B
IC206	UP-318-NO	OP AMP	1001	LM318N
IC207	UO-135-00	Opto Coupler	1004	6N135
IC208	UA-200-00	Dual Analog Switch	1005	DG200
IC209	UA-200-00	Dual Analog Switch	1005	DG200
IC210	UA-200-00	Dual Analog Switch	1005	DG200
IC211	UP-318-NO	OP AMP	1001	LM318N
IC300	UT-453-8B	Dual Precision Single Shot	1003	MC4538B
IC301	UP-318-NO	OP AMP	1001	LM318N
IC501	UR-791-5C	Regulator, −15V	1006	uA7915C
IC502	UO-135-00	Opto Coupler	1004	5N135
IC503	UP-301-AN	OP AMP	1001	LM301AN
IC601	UT-453-3B	Dual Precision Single Shot	1003	MC14538
IC602	UT-555-00	Timer	1002	NE555
IC901	UR-781-5C	Regulator, +15V	1006	uA7815C
		CONNECTORS (NON-CIRCUIT BOARD)		
J900	JT-020-02	Electron Tube, 14 pin	2001	3B14
J901	JF-030-01	RCPT, BNC, Female	3001	UG625
J902	JF-030-01	RCPT, BNC, Female	3001	UG625
J903	JF-030-01	RCPT, BNC, Female	3001	UG625
J904	JF-030-01	RCPT, BNC, Female	3001	UG625
J905	JT-020-01	Electron Tube, 9 pin	2001	9EM
J903	JF-030-01	RCPT, BNC, Female	2002	UG243
J904	JF-030-01	RCPT, BNC, Female	2002	UG243
		RELAYS		
K100	KS-010-01	Reed Relay, DPST	2201	E152AX3
		COILS		
L101	LN-010-01	76-125uh, Variable	2101	23A104RPC
L102	LS-010-02	60-120uh, Variable Shielded	2101	9055
L102	LN-010-09	61-100uh, Variable	2101	23A825PRC
L103	LK-010-03	270uh, Fixed, Shielded, ±10%	2102	1641-274
L104	LN-010-04	7.1-12.5uh, Variable	2101	23A105RPC
L105	LN-010-05	31-58uh, Variable	2101	23A475RPC
L106	LN-010-05	31-58uh, Variable (PAL)	2101	23A475RPC
L107	LN-010-05	31-58uh, Variable (PAL)	2101	23A475RPC
L108	LX-010-06	56uh, Fixed, ±10%	2101	1537-64
L109	LX-010-06	56uh, Fixed, ±10%	2102	1537-64
L201	LN-010-07	120uh, Fixed, ±10%	2101	1537-80
L300	LN-010-07	120uh, Fixed, ±10%	2101	1537-80
L401	LN-010-07	120uh, Fixed, ±10%	2102	1537-80
L901	LN-010-08	Trace Rotation	5001	L901

DESIG-NATOR	VIDEOTEK PART NO.	DESCRIPTION	MFGR. CODE	MFGR. PT. NO.
		CONNECTORS (CIRCUIT BOARD)		
P100	JS-010-01		2401	SS120G2
P101	JS-010-03		2403	22-01-2061
P101	JS-010-04		2403	22-01-2061
P102	JS-010-02		2403	SS120G2
P102	JS-010-02		2403	TS120GB
P103	JS-010-03		2403	22-03-2031
P103	JS-010-04		2403	22-01-2031
P104	JS-010-03		2403	22-03-2041
P104	JS-010-04		2403	22-01-2041
P105	JS-010-03		2403	22-01-2021
P105	JS-010-04		2403	22-01-2021
P106	JS-010-03		2403	22-03-2061
P106	JS-010-04		2403	22-01-2061
P107	JS-010-03		2403	22-03-2031
P107	JS-010-04		2403	22-01-2031
P108	JS-010-03		2403	22-03-2021
P108	JS-010-04		2403	22-01-2021
P109	JS-010-03		2403	22-03-2061
P109	JS-010-04		2403	22-01-2061
P110	JS-010-03		2403	22-03-2061
P110	JS-010-04		2403	22-01-2061
P111	JS-010-03		2403	22-03-2041
P111	JS-010-04		2403	22-01-2041
P112	JS-010-03		2403	22-03-2021
P112	JS-010-04		2403	22-01-2021
P118	JS-010-01		2401	SS120G2
P118	JS-010-02		2401	TS120GB
P119	JS-010-01		2401	SS120G2
P119	JS-010-02		2401	TS120GB
P120	JS-010-01		2401	SS120G2
P120	JS-010-02		2401	TS120GB
P121	JS-010-01		2401	SS120G2
P121	JS-010-02		2401	TS120GB
P137	JS-010-03		2403	SS-03-2041
P137	JS-010-04		2403	22-01-2041
P201	JS-010-03		2403	22-03-2021
P201	JS-010-04		2403	22-01-2021
P202	JS-010-01		2401	SS120G2
P202	JS-010-02		2401	TS120GB
P203	JS-010-03		2403	22-03-2021
P203	JS-010-04		2403	22-01-2021
P204	JS-010-01		2401	SS120G2
P204	JS-010-02		2401	TS120GB
P205	JS-010-03		2403	22-03-2041
P205	JS-010-04		2403	22-01-2041
P206	JS-010-03		2403	22-03-2031
P206	JS-010-04		2403	22-01-2031
P207	JS-010-03		2403	22-03-2031
P207	JS-010-04		2403	22-01-2021
P208	JS-010-01		2401	SS120G2
P208	JS-010-02		2401	TS120GB
P209	JS-010-01		2401	SS120G2
P210	JS-010-03		2403	22-03-2021
P210	JS-010-04		2403	SS-01-2021
P211	JS-010-03		2403	22-03-2031
P211	JS-010-04		2403	22-01-2031
P212	JS-010-03		2403	22-03-2031
P212	JS-010-04		2403	SS-01-2031
P213	JS-010-01		2401	SS120G2
P300	JS-010-03		2403	22-03-2051
P300	JS-010-04		2403	22-01-2051
P301	JS-010-03		2403	22-03-2041
P301	JS-010-04		2403	22-01-2041
P303	JS-010-03		2403	22-03-2031
P303	JS-010-04		2403	22-01-2031
P401	JS-010-03		2403	22-03-2031
P401	JS-010-04		2403	22-01-2031
P402	JS-010-03		2403	22-03-2021
P402	JS-010-04		2403	22-01-2021
P403	JS-010-03		2403	22-03-2021
P403	JS-010-04		2403	22-01-2021
P404	JS-010-03		2403	22-03-2031
P404	JS-010-04		2403	22-01-2031
P405	JS-010-03		2403	22-03-2021
P405	JS-010-04		2403	22-01-2021
P406	JS-010-03		2403	22-03-2021
P406	JS-010-04		2403	22-01-2021
P407	JS-010-03		2403	22-03-2021
P407	JS-010-04		2403	22-01-2021
P408	JS-010-03		2403	22-03-2051
P408	JS-010-04		2403	22-01-2051
P409	JS-010-03		2403	22-03-2061
P409	JS-010-04		2403	22-01-2061
P410	JS-010-03		2403	22-03-2041
P410	JS-010-04		2403	22-01-2041
P411	JS-010-03		2403	22-03-2041
P411	JS-010-04		2403	22-01-2041
P412	JS-010-03		2403	22-03-2031
P412	JS-010-04		2403	22-01-2031
P413	JS-010-03		2403	22-03-2021
P413	JS-010-04		2403	22-01-2021
P414	JS-010-03		2403	22-03-2031
P414	JS-010-04		2403	22-01-2031
P415	JS-010-03		2403	22-03-2041
P415	JS-010-04		2403	22-01-2041
P416	JS-010-03		2403	22-03-2041

DESIG-NATOR	VIDEOTEK PART NO.	DESCRIPTION	MFGR. CODE	MFGR. PT. NO.
		CONNECTORS (CIRCUIT BOARD)		
[illegible]16	JS-010-04		2403	22-01-2041
[illegible]417	JS-010-03		2403	22-03-2031
P417	JS-010-04		2403	22-01-2031
P501	JS-010-03		2403	22-02-2031
P501	JS-010-04		2403	22-01-2031
P502	JS-010-03		2403	22-03-2031
P502	JS-010-04		2403	22-01-2031
P503	JS-010-03		2403	22-03-2031
P503	JS-010-04		2403	22-01-2031
P504	JS-010-03		2403	22-03-2031
P504	JS-010-04		2403	22-01-2031
P505	JS-010-03		2403	22-03-2021
P505	JS-010-04		2403	22-01-2021
P506	JS-010-03		2403	22-03-2041
P506	JS-010-04		2403	22-01-2041
P507	JS-010-03		2403	22-03-2031
P507	JS-010-04		2403	22-01-2031
P508	JS-010-03		2403	22-03-2021
P508	JS-010-04		2403	22-01-2021
P509	JS-010-03		2403	22-03-2041
P509	JS-010-04		2403	22-01-2041
P511	JS-010-03		2403	22-03-2061
P511	JS-010-04		2403	22-01-2061
P512	JS-010-03		2403	22-03-2041
P512	JS-010-04		2403	22-01-2041
P520	TS-010-01		2401	TS220GC
P601	JS-010-03		2403	22-05-2061
P601	JS-010-04		2403	22-01-2061
P602	JS-010-03		2403	22-05-2061
P602	JS-010-04		2403	22-01-2061
P603	JS-010-03		2403	22-05-2041
P603	JS-010-04		2403	22-01-2041
P900	JS-010-04		2403	22-01-2031
P901	JS-010-04		2403	22-01-2031
P902	JS-010-04		2403	22-01-2031
P903	JS-010-04		2403	22-01-2031
P904	JS-010-04		2403	22-01-2031
P905	JS-010-04		2403	22-01-2031
P906	JS-010-03		2403	22-05-2081
P906	JS-010-04		2403	22-04-2081
P907	JS-010-03		2403	22-05-2041
P907	JS-010-04		2403	22-04-2021
P908	JS-010-03		2403	22-05-2041
[illegible]908	JS-010-04		2403	22-04-2041
	JS-010-05	Connector Clips	2403	08-50-0114
		RESISTORS		
R101	RX-104-42	100K, ¼wt, 5%	1301	K¼5P100EB
R102	RX-102-42	1K, ¼wt, 5%	1301	K¼5P1KB
R103	RX-102-42	1K, ¼wt, 5%	1301	K¼5P1KB
R104	RX-821-42	820, ¼wt, 5%	1301	K¼5P820EB
VR105	RT-102-23	1K, VAR, TRMR	1301	3386P-1-02
R110	RX-102-42	1K, ¼wt, 5%	1301	K¼5P1KB
R111	RX-821-42	820, ¼wt, 5%	1301	K¼5P820EB
R112	RX-221-42	220, ¼wt, 5%	1301	K¼5P220EB
R113	RX-152-43	1.5K, ½wt	1301	K½5P1K5B
R114	RX-131-42	430, ¼wt, 5%	1301	K¼5P430EB
R115	RX-122-42	1.2K, ¼wt, 5%	1301	K¼5P1K2B
R116	RX-102-42	1K, ¼wt, 5%	1301	K¼5P1KB
R117	RX-102-42	1K, ¼wt, 5%	1301	K¼5P1KB
R118	RX-102-42	1K, ¼wt, 5%	1301	K¼5P1KB
R119	RX-102-42	1K, ¼wt, 5%	1301	K¼5P1KB
R120	RX-471-42	470, ¼wt, 5%	1301	K¼5P470EB
R121	RX-563-42	56K, ¼wt, 5%	1301	K¼5P56KB
R122	RX-622-42	6.2K, ¼wt, 5%	1301	K¼5P6K2B
R123	RX-122-42	1.2K, ¼wt, 5%	1301	K¼5P1K2B
R124	RX-392-42	3.9K, ¼wt, 5%	1301	K¼5P3K9B
R125	RX-122-42	2.2K, ¼wt, 5%	1301	K¼5P2K2B
R126	RX-152-42	1.5K, ¼wt, 5%	1301	K¼5P1K5B
R127	RX-100-42	10, ¼wt, 5%	1301	K¼5P10EB
R128	RX-152-42	1.5K, ¼wt, 5%	1301	K¼5P1K5B
R129	RX-221-42	220, ¼wt, 5%	1301	K¼5P220EB
R130	RX-271-48	270, 5wt, 5%	1304	45J270
R131	RX-750-43	75, ½wt, 5%	1301	K½5P75B
R132	RX-271-42	270, ¼wt, 5%	1301	K¼5P270EB
R133	RX-182-42	1.8K, ¼wt, 5%	1301	K¼5P1K8B
R134	RX-222-42	2.2K, ¼wt, 5%	1301	K¼5P2K2B
R135	RX-622-42	6.2K, ¼wt, 5%	1301	K¼5P6K2B
R136	RX-392-42	3.9K, ¼wt, 5%	1301	K¼5P3K9B
R137	RX-152-42	1.5K, ¼wt, 5%	1301	K¼5P1K5B
VR138	RT-102-23	1K, VAR, TRMR	1305	3386P-1-102
R139	RX-563-42	56K, ¼wt, 5%	1301	K¼5P56KB
R140	RX-100-42	10, ¼wt, 5%	1301	K¼5P10EB
R141	TX-152-42	1.5K, ¼wt, 5%	1301	K¼5P1K5B
R142	RX-479-42	4.7K, ¼wt, 5%	1301	K¼5P4K7B
[illegible]143	RX-200-42	20, ¼wt, 5%	1301	K¼5P20B
[illegible]144	RX-471-42	470, ¼wt, 5%	1301	K¼5P470EB
[illegible]145	RX-753-42	75K, ¼wt, 5%	1301	K¼5P75KB
R146	RX-151-43	150, ½wt, 5%	1301	K½5P150B
R147	RX-122-42	1.2K, ¼wt, 5%	1301	K¼5P1K2B
R148	RX-152-42	1.5K, ¼wt, 5%	1301	K15P1K5B
R149	RX-750-42	75, ¼wt, 5%	1301	K¼5P75EB
R150	RX-750-42	75, ¼wt, 5%	1301	K¼5P75EB
R152	RX-100-42	10, ¼wt, 5%	1301	K¼5P10EB

DESIG-NATOR	VIDEOTEK PART NO.	DESCRIPTION	MFGR. CODE	MFGR. PT. NO.
		RESISTORS		
R153	RX-100-42	10, ¼wt, 5%	1301	K¼5P10EB
R154	RP-010-08	3K, 5wt, 1% (Flameproof)	1304	43F3K0
R155	RX-224-42	220K, ¼wt, 5%	1301	K¼5P220KB
R156	RP-010-08	3K, 5wt, 1% (Flameproof)	1304	45F3K0
R157	RX-224-42	220K, ¼wt, 5%	1301	K15P220KB
R158	RX-102-42	1K, ¼wt, 5%	1301	K¼5P1KB
R159	RX-122-42	1.2K, ¼wt, 5%	1301	K¼5P1K2B
R160	RX-183-42	18K, ¼wt, 5%	1301	K¼5P18KB
R160	RX-103-42	10K, ¼wt, 5% (PAL)	1301	K¼5P22KB
R161	RX-153-42	15K, ¼wt, 5%	1301	K¼5P15KB
R162	RX-330-42	22, ¼wt, 5%	1301	K¼5P33EB
R163	RX-682-42	6.8K, ¼wt, 5%	1301	K¼5P5K8B
R164	RX-103-42	10K, ¼wt, 5%	1301	K¼5P22KB
R164	RX-222-42	22K, ¼wt, 5% (PAL)	1301	K¼5P22KB
R165	RX-103-42	10K, ¼wt, 5%	1301	K¼5P22KB
R165	RX-222-42	22K, ¼wt, 5% (PAL)	1301	K¼5P22KB
R166	RX-561-42	560, ¼wt, 5%	1301	K¼5P560EB
R167	RX-471-42	470, ¼wt, 5%	1301	K¼5P470EB
R169	RX-152-42	1.5K, ¼wt, 5%	1301	K¼5P1K5B
R170	RX-102-42	1K, ¼wt, 5%	1301	K¼5P1KB
R171	RX-101-42	100, ¼wt, 5%	1301	K¼5P100EB
R172	RX-101-42	100, ¼wt, 5%	1301	K¼5P100EB
R200	RX-153-42	15K, ¼wt, 5%	1301	K¼5P15KB
R201	RX-102-42	1K, ¼wt, 5%	1301	K¼5P1KB
R202	RX-272-42	2.7K, ¼wt, 5%	1301	K¼5P2K7B
R203	RX-472-42	4.7K, ¼wt, 5%	1301	K¼5P4K7B
R204	RX-103-42	10K, ¼wt, 5%	1301	K¼5P10KB
R205	RX-222-42	2.2K, ¼wt, 5%	1301	K¼5P2K2B
R206	RX-223-42	22K, ¼wt, 5%	1301	K¼5P22KB
R207	RX-104-42	100K, ¼wt, 5%	1301	K¼5P100KB
R208	RX-334-42	330K, ¼wt, 5%	1301	K¼5P330KB
R209	RX-153-42	15K, ¼wt, 5%	1301	K¼5P15KB
R210	RX-274-42	270K, ¼wt, 5%	1301	K¼5P270KB
VR211	RT-103-23	10K, VAR, TRMR	1305	3386P-1-103
R212	RX-221-42	220, ¼wt, 5%	1301	K¼5P220EB
R213	RX-333-42	33K, ¼wt, 5%	1301	K¼5P33KB
R214	RX-471-72	470, ¼wt, 5%	1301	K¼5P470EB
R215	RX-471-42	470, ¼wt, 5%	1301	K¼5P470EB
R216	RX-332-42	3.3K, ¼wt, 5%	1301	K¼5P3K3B
R217	RX-182-42	1.8K, ¼wt, 5%	1301	K¼5P1K8B
R218	RX-103-42	10K, ¼wt, 5%	1301	K¼5P10KB
R219	RX-103-42	10K, ¼wt, 5%	1301	K¼5P10KB
R220	RX-273-42	27K, ¼wt, 5%	1301	K¼5P27KB
R221	RX-273-42	27K, ¼wt, 5%	1301	K¼5P27KB
R222	RX-332-42	3.3K, ¼wt, 5%	1301	K¼5P3K3B
R223	RX-222-42	2.2K, ¼wt, 5%	1301	K¼5P2K2B
R224	RX-332-42	3.3K, ¼wt, 5%	1301	K¼5P3K3B
R225	RX-821-42	820, ¼wt, 5%	1301	K¼5P820EB
R226	RX-103-42	10K, ¼wt, 5%	1301	K¼5P10KB
R227	RX-822-42	8.2K, ¼wt, 5%	1301	K¼5P8K2B
R228	RX-472-42	4.7K, ¼wt, 5%	1301	K¼5P4K7B
R230	RX-153-42	15K, ¼wt, 5%	1301	K¼5P15KB
R231	RX-472-42	4.7K, ¼wt, 5%	1301	K¼5P4K7B
R232	RX-272-42	2.7K, ¼wt, 5%	1301	K¼5P2K7B
R234	RX-104-42	100K, ¼wt, 5%	1301	K¼5P100KB
R235	RX-103-42	10K, ¼wt, 5%	1301	K¼5P10KB
R236	RX-229-42	2.2K, ¼wt, 5%	1301	K¼5P2E2B
R237	RX-229-42	2.2, ¼wt, 5%	1301	K¼5P2E2B
R238	RX-474-42	470K, ¼wt, 5%	1301	K¼5P470KB
R239	RX-272-42	2.7K, ¼wt, 5%	1301	K¼5P2K7B
R240	RX-474-42	470K, ¼wt, 5%	1301	K¼5P470KB
R241	RX-103-42	10K, ¼wt, 5%	1301	K¼5P10KB
R242	RX-332-42	3.3K, ¼wt, 5%	1301	K¼5P3K3B
R243	RX-122-42	1.2K, ¼wt, 5%	1301	K¼5P1K2B
R244	RX-103-42	10K, ¼wt, 5%	1301	k¼5P10KB
R245	RX-101-42	100, ¼wt, 5%	1303	K¼5P100EB
R246	RX-183-42	18K, ¼wt, 5%	1301	K¼5P10KB
R247	RX-153-42	15K, ¼wt, 5%	1301	K¼5P15KB
R248	RX-154-42	150K, ¼wt, 5%	1301	K¼5P150KB
R248	RX-224-42	220K, ¼wt, 5% (PAL)	1301	K¼5P220KB
VR249	RT-104-23	100K, VAR, TRMR	1305	3386P-1-104
R250	RX-472-42	4.7K, ¼wt, 5%	1301	K¼5P4K7B
R251	RX-224-42	220K, ¼wt, 5%	1301	K¼5P220KB
R252	RX-332-42	3.3K, ¼wt, 5%	1301	K¼5P3K3B
R253	RP-010-01	6.04K, ¼wt, 1%	1301	KRN550D604F
R254	RX-274-42	270K, ¼wt, 5%	1301	K¼5P270KB
R255	RX-274-42	270K, ¼wt, 5%	1301	K¼5P270KB
R256	RX-103-42	10K, ¼wt, 5%	1301	K¼5P10KB
R257	RX-331-42	330, ¼wt, 5%	1301	K¼5P100EB
R258	RX-103-42	10K, ¼wt, 5%	1301	K¼5P10KB
VR259	RT-203-23	20K, VAR, TRMR	1305	3386P-1-203
R260	RX-563-42	56K, ¼wt, 5%	1301	K¼5P56KB
R261	RX-273-42	27K, ¼wt, 5%	1301	K¼5P27KB
R262	RX-473-42	47K, ¼wt, 5%	1301	K¼5P47KB
R263	RX-101-42	100, ¼wt, 5%	1301	K¼5P100EB
R264	RX-182-42	1.8K, ¼wt, 5%	1301	K¼5P1K8B
R265	RX-471-42	470, ¼wt, 5%	1301	K¼5P470EB
VR266	RT-204-23	200K, VAR, TRMR	1301	3386P-1-203
R267	RX-472-42	4.7K, ¼wt, 5%	1301	K¼5P4K7B
R268	RX-332-42	3.3K, ¼wt, 5%	1301	K¼5P3K3B
R269	RX-224-42	220K, ¼wt, 5%	1301	K¼5P220KB
R274	RX-154-42	150K, ¼wt, 5%	1301	K¼5P150KB
R275	RX-562-42	5.6K, ¼wt, 5%	1301	K¼5P5K6B
R276	RX-562-42	5.6K, ¼wt, 5%	1301	K¼5P5K6B
R277	RX-123-42	12K, ¼wt, 5%	1301	K¼5P12KB
R278	RX-332-42	3.3K, ¼wt, 5%	1301	K¼5P3K3B

RESISTORS

DESIG-NATOR	VIDEOTEK PART NO.	DESCRIPTION	MFGR. CODE	MFGR. PT. NO.
R279	RX-472-42	4.7K, ¼wt, 5%	1301	K¼5P4K7B
R280	RX-681-43	680, ½wt, 5%	1301	K½5P680EB
R281	RX-392-42	3.9K, ¼wt, 5%	1301	K¼5P3K9B
R282	RX-562-42	5.6K, ¼wt, 5%	1301	K¼5P5K6B
R283	RX-104-42	100K, ¼wt, 5%	1301	K¼5P100KB
R284	RX-472-42	4.7K, ¼wt, 5%	1301	K¼5P4K7B
R287	RX-103-42	10K ¼wt, 5%	1301	K¼5P10KB
R300	RX-472-42	4.7K, ¼wt, 5%	1301	K¼5P4K7B
R301	RX-472-42	4.7K, ¼wt, 5%	1301	K¼5P4K7B
R302	RX-103-42	10K, ¼wt, 5%	1301	K¼5P10K
R304	RX-225-42	2.2M, ¼wt, 5%	1301	K¼5P2M2B
R308	RX-223-42	22K, ¼wt, 5%	1301	K¼5P2K2B
R309	RX-472-42	4.7K, ¼wt, 5%	1301	K¼5P4K7B
R310	RX-562-42	5.6K, ¼wt, 5%	1301	K¼5P5K6B
R313	RX-222-43	2.2K, ¼wt, 5%	1301	K¼5P2K2B
VR314	RT-102-23	1K, VAR, TRMR	1301	3386P-1-102
R315	RX-272-42	2.7K, ¼wt, 5%	1301	K¼5P2K7B
VR316	RT-203-23	20K, VAR, TRMR	1305	3386P-1-203
R317	RX-223-42	22K, ¼wt, 5%	1301	K¼5P22KB
R333	RF-242-45	2.4K, 2wt, 5% (Flameproof)	1301	KRS2B2.4KJ
R334	RX-473-42	47K, ¼wt, 5%	1301	K¼5P47KB
R401	RX-471-42	470, ¼wt, 5%	1301	K¼5P470EB
R403	RX-182-42	1.8K, ¼wt, 5%	1301	K¼5P1K8B
R404	RF-183-44	18K, 1wt, 5% (Flameproof)	1301	KRS1FB18K
R405	RX-393-43	39K, ½wt, 5%	1301	K15P39KB
R406	RX-393-43	39K, ½wt, 5%	1301	K½5P38KB
R407	RP-010-02	2.32, ¼wt, 1%	1301	KRN550D232F
R408	RP-010-03	26.7K, ¼wt, 1%	1301	KRN550D267F
R409	RP-010-04	56.2K, ¼wt, 1%	1301	KRN550D562F
R410	RP-010-05	2.00K, ¼wt, 1%	1301	KRN550D200F
R411	RP-010-06	3.40K, ¼wt, 1%	1301	KRN550D340F
R412	RP-010-07	3.57K, ¼wt, 1%	1301	KRN550D357F
R413	RX-471-42	470, ¼wt, 5%	1301	K¼5P470EB
R414	RF-183-44	18K, 1wt, 5% (Flameproof)	1301	KRS1FB18K
R416	RX-682-42	6.8K, ¼wt, 5%	1301	K¼5P6K8B
R417	RX-222-42	2.2K, ¼wt, 5%	1301	K¼5P2K2B
R418	RX-470-42	47, ¼wt, 5%	1301	K¼5P47EB
R419	RF-333-45	33K, 2wt, 5% (Flameproof)	1301	KRS2FB33K
R420	RF-393-45	39K, 2wt, 5% (Flameproof)	1301	KRS2FB39K
R421	RX-751-42	750, ¼wt, 5%	1301	K¼5P750EB
VR422	RT-102-13	1K, VAR, TRMR	1305	33865-1-102
R423	RX-102-42	1K, ¼wt, 5%	1301	K¼5P1KB
VR424	RT-102-13	1K, VAR, TRMR	1305	3386S-1-102
R425	RP-010-09	6.19K, ¼wt, 1%	1301	KRN550D619F
R426	RP-010-09	6.19K, ¼wt, 1%	1301	KRN550D619F
R427	RX-102-42	1K, ¼wt, 5%	1301	K¼5P1KB
R428	RX-564-42	560K, ¼wt, 5%	1301	K¼5P560KB
R430	RX-244-42	240K, ¼wt, 5%	1301	K¼5P240KB
R431	RX-752-42	7.5K, ¼wt, 5%	1301	K¼5P7K5B
R432	RX-394-43	390K, ½wt, 5%	1301	K¼5P390KB
R433	RX-182-42	1.8K, ¼wt, 5%	1301	K¼5P1K8B
R434	RX-682-42	6.8K, ¼wt, 5%	1301	K¼5P6K8B
R435	RX-101-42	100, 1¼wt, 5%	1301	K¼5P100EB
VR435	RT-202-13	2K, VAR, TRMR	1305	3386S-1-202
R436	RX-564-42	560K, ¼wt, 5%	1301	K¼5P560KB
R437	RX-102-42	1K, ¼wt, 5%	1301	K¼5P1KB
R438	RX-154-42	150K, ¼wt, 5%	1301	K¼5P150KB
R439	RX-562-42	5.6K, ¼wt, 5%	1301	K¼5P5K6B
VR439	RT-502-13	5K, VAR, TRMR	1305	3386S-1-502
R440	RX-912-42	9.1K, ¼wt, 5%	1301	K¼5P9K1B
R441	RX-154-42	150K, ¼wt, 5%	1301	K¼5P150KB
R442	RX-392-42	3.9K, ¼wt, 5%	1301	K¼5P3K9B
R443	RX-154-42	150K, ¼wt, 5%	1301	K¼5P150KB
R444	RX-154-42	150K, ¼wt, 5%	1301	K¼4P150KB
R446	RX-684-42	680K, ¼wt, 5%	1301	K¼5P680KB
R447	RX-684-42	680K, ¼wt, 5%	1301	K¼5P680KB
R453	RX-682-42	6.8K, ¼wt, 5%	1301	K¼5P6K8B
R454	RF-470-44	47, 1wt, 5%	1301	KRS2FB47E
R501	RX-470-43	4.7K, ½wt, 5%	1301	K½5P4E7B
R502	RX-471-43	470, ½wt, 5%	1301	K½5P470EB
R503	RX-479-42	4.7, ½wt, 5%	1301	K¼5P4E7B
R505	RX-103-42	10K, ¼wt, 5%	1301	K¼5P10KB
R508	RX-821-42	820, ¼wt, 5%	1301	K¼5P820EB
R507	RX-151-42	150, ¼wt, 5%	1301	K¼5P150EB
F508	RX-123-42	12K, ¼wt, 5%	1301	K¼5P12KB
R509	RX-272-42	2.7K, ¼wt, 5%	1301	K¼5P2K7B
R510	RX-102-42	1K, ¼wt, 5%	1301	K¼5P1KB
R511	RX-682-42	6.8K, ¼wt, 5%	1301	K¼5P6K8B
R512	RX-682-42	6.8K, ¼wt, 5%	1301	K¼5P6K8B
R514	RX-221-42	220, ¼wt, 5%	1301	K¼5P220EB
R515	RX-221-42	1.2K, ¼wt, 5%	1301	K¼5P1K2B
R516	RX-472-42	4.7K, ¼wt, 5%	1301	K¼5P4K7B
R517	RP-010-03	26.7K, ¼wt, 1%	1301	KRN550D267F
R518	RP-010-03	26.7K, ¼wt, 1%	1301	KRN550D267F
R519	RX-153-42	15K, ¼wt, 5%	1301	K¼5P15KB
R520	RX-101-42	100, ¼wt, 5%	1301	K¼5P100EB
R530	RX-331-42	330, ¼wt, 5%	1301	K¼5P330EB
R531	RX-182-42	1.8K, ¼wt, 5%	1301	K¼5P1K8B
R532	RX-681-42	680, ¼wt, 5%	1301	K¼5P680EB
R533	RX-562-42	5.6K, ¼wt, 5%	1301	K¼5P5K6B
R534	RX-472-42	4.7K, ¼wt, 5%	1301	K¼5P4K7B
R535	RX-272-42	2.7K, ¼wt, 5%	1301	K¼5P2K7B
R536	RX-102-42	1K, ¼wt, 5%	1301	K¼5P1KB
VR537	RT-104-23	100K, VAR, TRMR	1305	3386P-1-104
R538	RX-104-42	100K, ¼wt, 5%	1301	K¼5P100KB
R539	RH-020-02	4M, 4wt, 5%	1301	208F
R540	RX-225-42	2.2M, ¼wt, 5%	1301	K¼5P2M2B
R541	RX-225-42	2.2M, ¼wt, 5%	1301	K¼5P2M2B
R542	RX-683-42	68K, ¼wt, 5%	1301	K¼5P68KB
R543	RX-683-42	68K, ¼wt, 5%	1301	K¼5P68KB
R544	RX-472-42	4.7K, ¼wt, 5%	1301	K¼5P4K7B
R545	RX-222-42	2.2K, ¼wt, 5%	1301	K¼5P2K2B
R546	RH-020-03	15M, 1wt, 5%	1301	104F
R547	RX-474-42	470K, ¼wt, 5%	1301	K¼5P470KB
R548	RX-474-42	470K, ¼wt, 5%	1301	K¼5P470KB
R601	RX-104-42	100K, ¼wt, 5%	1301	K¼5P100KB
R602	RX-683-42	68K, ¼wt, 5%	1301	K¼5P68KB
R603	RX-563-42	56K, ¼wt, 5%	1301	K¼5P56K
R604	RX-224-42	220K, ¼wt, 5%	1301	K¼5P220KB
R605	TX-472-42	4.7K, ¼wt, 5%	1301	K¼5P4K7B
VR606	RT-502-23	5K, VAR, TRMR	1305	3386P-1-502
VR607	RT-502-23	5K, VAR, TRMR	1305	3386P-1-502
R608	RX-472-42	4.7K, ¼wt, 5%	1301	K¼5P4K7B
R609	RX-822-42	8.2,, ¼wt, 5%	1301	K¼5P8K2B
R610	RX-332-42	3.3K, ¼wt, 5%	1301	K¼5P3K3B
R611	RX-222-42	2.2K, ¼wt, 5%	1301	K¼5P2K2B
R612	RX-222-42	2.2K, ¼wt, 5%	1301	K¼5P2K2B
R613	RX-221-42	220, ¼wt, 5%	1301	K¼5P220EB
R614	RX-221-42	220, ¼wt, 5%	1301	K¼5P220EB
R615	RX-221-42	220, ¼wt, 5%	1301	K¼5P220EB
R616	RX-332-42	3.3K, ¼wt, 5%	1301	K¼5P3K3B
R617	RX-392-42	3.9K, ¼wt, 5%	1301	K¼5P3K9B
R618	RX-223-42	22K, ¼wt, 5%	1301	K¼5P22KB
R619	RX-105-42	1M, ¼wt, 5%	1301	K¼5P1MB
R620	RX-334-42	330K, ¼wt, 5%	1301	K¼5P330KB
VR621	RT-203-23	20K, VAR, TRMR	1305	3386P-1-203
R622	RX-154-42	150K, ¼wt, 5%	1301	K¼5P150KB
R623	RX-474-42	470K, ¼wt, 5%	1301	K¼5P470K
R624	RX-222-42	2.2K, ¼wt, 5%	1301	K¼5P2K2B
R625	RX-182-42	1.8K, ¼wt, 5%	1301	K¼5P1K8B
R626	RX-333-42	33K, ¼wt, 5%	1301	K¼5P33KB
R627	RX-153-42	15K, ¼wt, 5%	1301	K¼5P15KB
R628	RX-333-42	33K, ¼wt, 5%	1301	K¼5P33KB
R629	RX-223-42	22K, ¼wt, 5%	1301	K¼5P22KB
VR630	RT-502-23	5K, VAR, TRMR	1305	3386P-1-502
R631	RX-821-42	820, ¼wt, 5%	1301	K¼5P820EB
R632	RH-225-42	2.2K, ¼wt, 5%	1301	K¼5P2M2B
R633	RX-104-42	100K, ¼wt, 5%	1301	K¼5P100KB
R633	RX-822-42	8.2K, ¼wt, 5%	1301	K¼5P8K2B
R634	RX-475-42	4.7M, ¼wt, 5%	1301	K¼5P4M7B
R635	RX-272-42	2.7K, ¼wt, 5%	1301	K¼5P2K7B
R636	RX-104-42	100K, ¼wt, 5%	1301	K¼5P100K
R637	RX-391-42	390, ¼wt, 5%	1301	K¼5P390EB
R901	RX-105-42	1M, ¼wt, 5%	1301	K¼5P1MB
R902	RX-101-42	100, ¼wt, 5%	1301	K¼5P100EB
R903	RX-821-42	820, ¼wt, 5%	1301	K¼5P820EB
R904	RX-392-42	3.9K, ¼wt, 5%	1301	K¼5P3K9B
R905	RX-751-42	750, ¼wt, 5%	1301	K¼5P750EB
R906	RX-122-42	1.2K, ¼wt, 5%	1301	K¼5P1K2B
R907	RX-334-42	330K, ¼wt, 5% (Nominal)	1301	K¼5P330KB
R908	RX-471-42	470, ¼wt, 5%	1301	K¼5P470EB
R910	RX-182-42	1.8K, ¼wt, 5%	1301	K¼5P1KB
R910	RX-102-42	1K, ¼wt, 5% (PAL)	1301	K¼5P1KB
VR901	RL-255-64	2.5M, ± 20%	1501	381L2.5M
VR902	RL-502-64	5K, ± 10%	1501	381L5K
VR903	RL-255-64	2.5M, ± 20%	1501	381L2.5M
VR904	RV-103-54	10K, ± 10%	1501	381N10K
VR905	RH-020-05	3M, ± 20%	6001	381HV3M
VR906	HS-010-01	3K, ± 10% (Assembly)	6001	381S-3K
VR907	RH-020-04	150K, ± 10%	6001	381HV-150K
VR908	RP-010-10	2K, ± %	1501	73JA-2K
VR909	HS-010-02	3K, ± 10% (Switch Assembly)	6001	5-29731-312
R915	RX-474-44	470K, 1wt, 5%	1301	KRSIFB470K

SWITCHES

SW900	SS-010-01	Slide, DPDT	1601	46206LFR
SW901	SL-020-01	Lever, 4 pole	6001	5-55462-727
SW902	SL-020-02	Lever, 3 pole	6001	5-55482-017
SW903	SL-010-02	Slide, DPDT	1603	GF126-0032
SW904	SL-010-02	Slide, DPDT	1603	GF126-0032
SW906	HS-010-01	DPDT (Assembly)	1501	381S-3K
SW908	HS-010-02	Rotary water (Assembly)	6001	5-29731-312
SW909	HS-010-02	Snap Switch (Assembly)	6001	5-29731-312

TEST POINTS

TP100	TX-010-01		2401	TS220GC
TP110	TX-010-01		2401	TS220GC
TP170	TX-010-01		2401	TS220GC
TP200	TX-010-01		2401	TS220GC
TP202	TX-010-01		2401	TS220GC
TP203	TX-010-01		2401	TS220GC
TP205	TX-010-01		2401	TS220GC
TP210	TX-010-01		2401	TS220GC
TP225	TX-010-01		2401	TS220GC
TP230	TX-010-01		2401	TS220GC
TP215	TX-010-01		2401	TS220GC
TP300	TS-010-01		2401	TS220GC
TP401	TS-010-01		2401	TS220GC
TP501	TS-010-01		2401	TS220GC
TP502	TS-010-01		2401	TS220GC

DESIG-NATOR	VIDEOTEK PART NO.	DESCRIPTION	MFGR. CODE	MFGR. PT. NO.
		TRANSFORMERS		
[illegible]	TP-010-02	Power Transformer	6001	T900
		TRANSISTORS, SILICON		
Q101	QN-412-40	NPN	1301	2N4124
Q102	QN-412-40	NPN	1301	2N4124
Q103	QP-412-60	PNP	1301	2N4126
Q105	QN-412-40	NPN	1301	2N4124
Q106	QP-412-60	PNP	1301	2N4126
Q107	QN-412-40	NPN	1301	2N4124
Q108	QP-412-60	PNP	1301	2N4126
Q109	QP-41D-50	PNP	1101	D41D5
Q110	QP-412-60	PNP	1301	2N4126
Q111	QN-40D-50	NPN	1101	D40D5
Q112	QN-40N-20	NPN	1101	D40N2
Q113	QN-40N-20	NPN	1101	D40N2
Q114	QN-40N-20	NPN	1101	D40D5
Q201	QN-412-40	NPN	1301	2N4124
Q202	QP-412-60	PNP	1301	2N4126
Q203	QN-412-40	NPN	1301	2N4124
Q204	QN-412-40	NPN	1301	2N4124
Q205	QN-412-40	NPN	1301	2N4124
Q206	QN-412-40	NPN	1301	2N4124
Q207	QN-412-40	NPN	1301	2N4124
Q208	QN-412-40	NPN	1301	2N4124
Q209	QS-236-90	NPN	1301	MPS2369
Q210	QP-412-60	PNP	1301	2N4126
Q211	QN-412-40	NPN	1301	2N4124
Q212	QP-412-60	PNP	1301	2N4126
Q213	QN-412-40	NPN	1301	2N4124
Q214	QN-412-40	NPN	1301	2N4124
Q215	QN-412-40	NPN	1301	2N4124
Q216	QN-412-40	NPN	1301	2N4124
Q217	QN-412-40	NPN	1301	2N4124
Q218	QN-412-40	NPN	1301	2N4124
Q300	QN-412-40	NPN	1301	2N4124
Q301	QN-412-40	NPN	1301	2N4124
Q303	QN-439-10	FET, N-Channel	1003	2N4391
Q331	QN-40N-20	NPN	1101	D40N2
Q401	QN-131-90	NPN	1103	SD1319
Q402	QN-343-90	NPN	1102	2N3439
Q403	QN-343-90	NPN	1102	2N3439
[illegible]04	QN-SA4-20	NPN	1101	MPSA42
[illegible]5	QN-412-40	NPN	1301	2N4124
[illegible]6	QN-SA4-20	NPN	1101	MPSA42
[illegible]407	QN-SA4-20	NPN	1101	MPSA42
Q408	QN-40N-20	NPN	1101	D40N2
Q409	QN-40N-20	NPN	1101	D40N2
Q410	QN-SA4-20	NPN	1101	MPSA42
Q411	QN-412-40	NPN	1301	2N4124
Q412	QN-SA4-20	NPN	1101	MPSA42
Q501	QN-44R-80	NPN	1101	D44R8
Q502	QN-343-90	NPN	1102	2N3439
Q503	QN-40D-50	NPN	1101	D40D5
Q504	QN-412-40	NPN	1301	2N4124
Q505	QN-412-40	NPN	1301	2N4124
Q530	QP-412-60	PNP	1301	2N4126
Q531	QN-412-40	NPN	1301	2N4124
Q532	QN-412-40	NPN	1301	2N4124
Q533	QN-412-40	NPN	1301	2N4124
Q534	QN-40N-20	NPN	1101	D40N2
Q535	QP-SA9-20	PNP	1102	MPSA92
Q536	SP-SA9-20	PNP	1102	MPSA92
Q537	QN-40N-20	NPN	1101	D40N2
Q538	QP-SA9-20	PNP	1102	MPSA92
Q539	QN-40N-20	NPN	1101	D40N2
Q600	QN-S23-69	NPN	1101	MPS2369
Q601	QN-412-40	NPN	1301	2N4124
Q602	QN-412-40	NPN	1301	2N4124
Q603	QP-412-60	PNP	1102	2N4126
Q604	QP-412-60	PNP	1301	2N4126
Q605	QN-412-40	NPN	1301	2N4124
Q606	QN-412-40	NPN	1301	2N4124
Q607	QN-412-40	NPN	1301	2N4124
Q608	QN-412-40	NPN	1301	2N4124
Q609	QP-412-60	PNP	1301	2N4126
Q610	QP-412-60	PNP	1301	2N4126
Q611	QN-412-40	NPN	1301	2N4124
Q612	QN-412-40	NPN	1301	2N4124
Q900	QN-44R-80	NPN	1101	D44R8
Q901	QN-44R-80	NPN	1101	D44R8
Q902	QN-44R-80	NPN	1101	D44R8
Q904	QN-44R-80	NPN	1101	D44R8
		CRT		
[illegible]00	HS-014-04	5", Post Accelerated	6001	V900
		ZENERS		
Z100	DZ-413-20	82V, 250mW, 5%	1201	1N4132
Z101	DZ-413-20	82V, 250mW, 5%	1201	1N4132
Z202	DZ-523-6B	7.5V, 500mW, 5%	1301	1N5236B
Z203	DZ-523-6B	7.5V, 500mW, 5%	1301	1N5236B

DESIG-NATOR	VIDEOTEK PART NO.	DESCRIPTION	MFGR. CODE	MFGR. PT. NO.
		ZENERS		
Z331	DZ-407-00	100V, 500mW, 5% Reference Diode		
Z401	DZ-961-B0	10V, 400mW, 5%	1301	1N961B
Z402	DZ-474-3A	13V, 1W, 5%	1301	1N4743A
Z403	DZ-476-4A	100V, 1W, 5%	1003	1N4764A
Z404	DZ-476-4A	100V, 1W, 5%	1003	1N4764A
Z405	DZ-961-B0	10V, 400mW, 5%	1301	1N961B
Z406	DZ-961-B0	10V, 400mW, 5%	1301	1N961B
Z501	DZ-474-3A	13V, 1W, 5%	1301	1N4743A
Z502	DZ-474-3A	13V, 1W, 5%	1301	1N4743A
Z503	DZ-525-5B	28V, 500mw, 5%	1003	1N5255B
Z530	DZ-523-0B	4.7V, 500mW, 5%	1301	1N5230B
Z530	DZ-523-0B	4.7V, 500mW, 5%	1301	1N5230B
Z531	DZ-985-B0	100V, 500mW, 5%	1003	1N985B
Z900	DZ-572-4B	5.1V, 500mW, 5%	1301	1N5724B
	JP-040-01	9 pin miniature plug and cover	2402	66-897
	JZ-050-01	Terminator	6001	3406
	MS-010-01	Service Manual	6001	TSM-5-SM

Cross Index

MFGR. CODE NUMBER TO MANUFACTURER

MFGR. CODE	*MANUFACTURER*
1001	National Semiconductor
1002	Signetics Corp.
1003	Motorola Corp.
1004	Hewlett Packard Components
1005	Siliconix Corp.
1006	Fairchild Corp.
1101	General Electric Semiconductors
1102	Radio Corp. of America
1103	Solid State Microwave
1201	High Voltage Semiconductor
1202	General Semiconductor Industries
1203	Dialight
1301	Kagan Components
1303	Victoreen Instrument Division
1304	Ohmite Mfg. Co.
1305	Bourns, Inc.
1401	Nissi Capacitors
1402	Sprague Products Company
1403	Micro Capacitor
1501	Clarostat Mfg. Co., Inc.
1601	Switchcraft, Inc.
1603	C.W. Industries
1701	General Instrument Corp.
2001	TRW-Cinch Electronic Supply
2101	Miller Products
2102	Delevan American Precision Industries
2201	Electronics Applications, Inc.
2401	Samtec
2402	Amphenol Sales
2403	Molex, Inc.
2701	Bussman Mfg.
2702	Littlefuse, Inc.
3001	AVA Corp.
6001	Videotek, Inc.

Accessories

Manuf. Part No.	Description	Quantity
86-897	Plug, 9 pin miniature	1
	Cover, 9 pin plug	1
3406	Terminator, 75, ½W, 1%	1
TSM-5-SM	Manual, Service and Instruction	1

Ventilation and Dimension Drawings

Cooling the TSM-5

The TSM-5 is cooled by convection air flow through the instrument. Allow at least 2 inches clearance at the rear and the left or right side (or about 1 inch on the left and right sides) of the instrument for air circulation. If possible, allow some space (¼ inch or more) at the top and/or bottom for additional air circulation through the ventilating holes in the metal cabinet. Temperature of the circulating air should not exceed +50° C (122° F) for safe operation.

Rackmounting the TSM-5

The metal cabinet for the TSM-5 provides the proper electrical environment for the instrument, minimized handling damage and reduces dust collection within the instrument.

The TSM-5 is designed to be cradle-mounted in a standard 19-inch rack or console side by side with another TSM-5 or other instrument. If only one TSM-5 is mounted in the 19'' rack, a blank panel can be obtained from Videotek for the unused side.

Cabinet Options

Without Cabinet Options

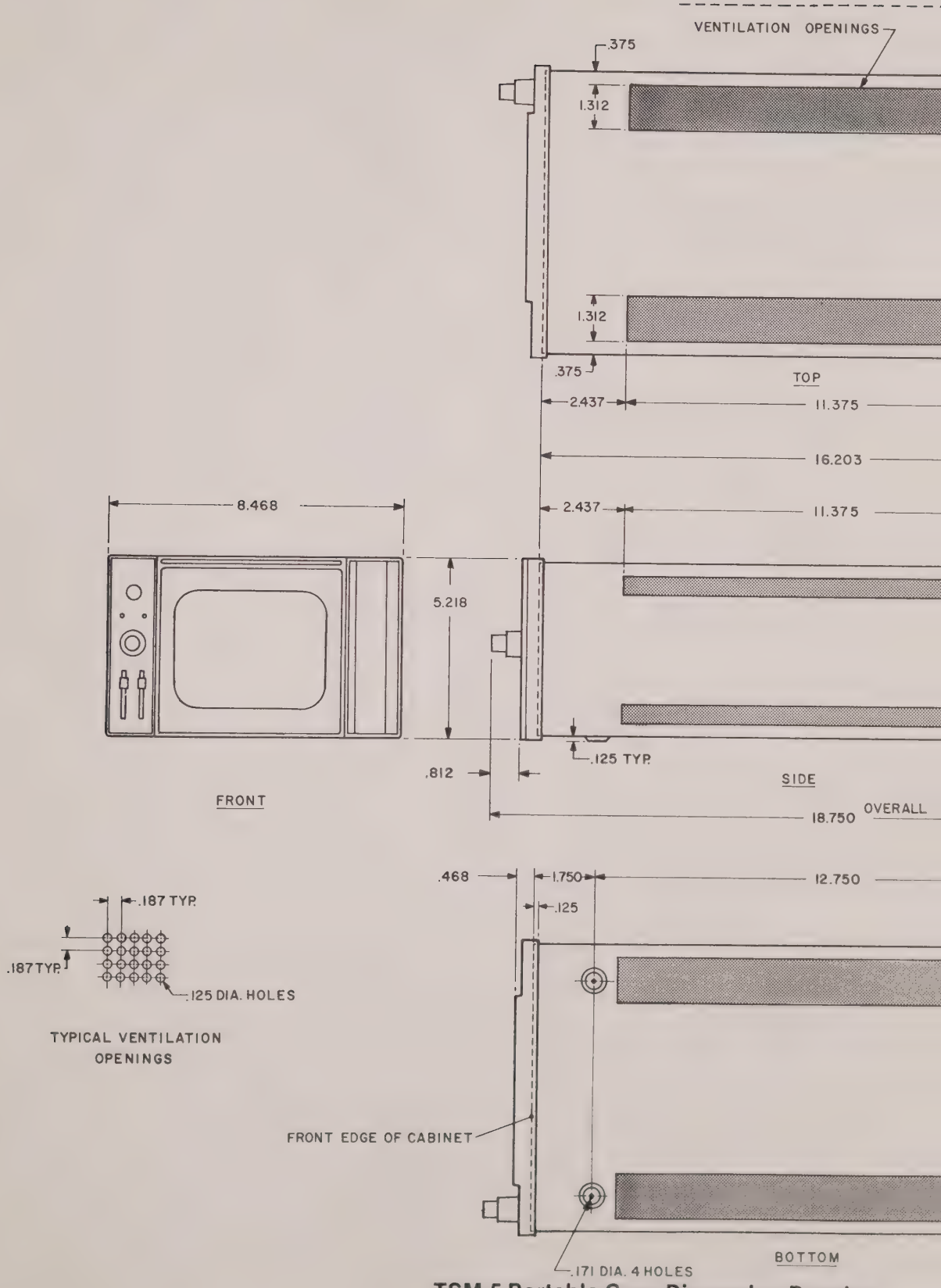
This is a standard TSM-5 without a metal cabinet. Unit is shipped in a cardboard sleeve for protection.

Portable Usage Option

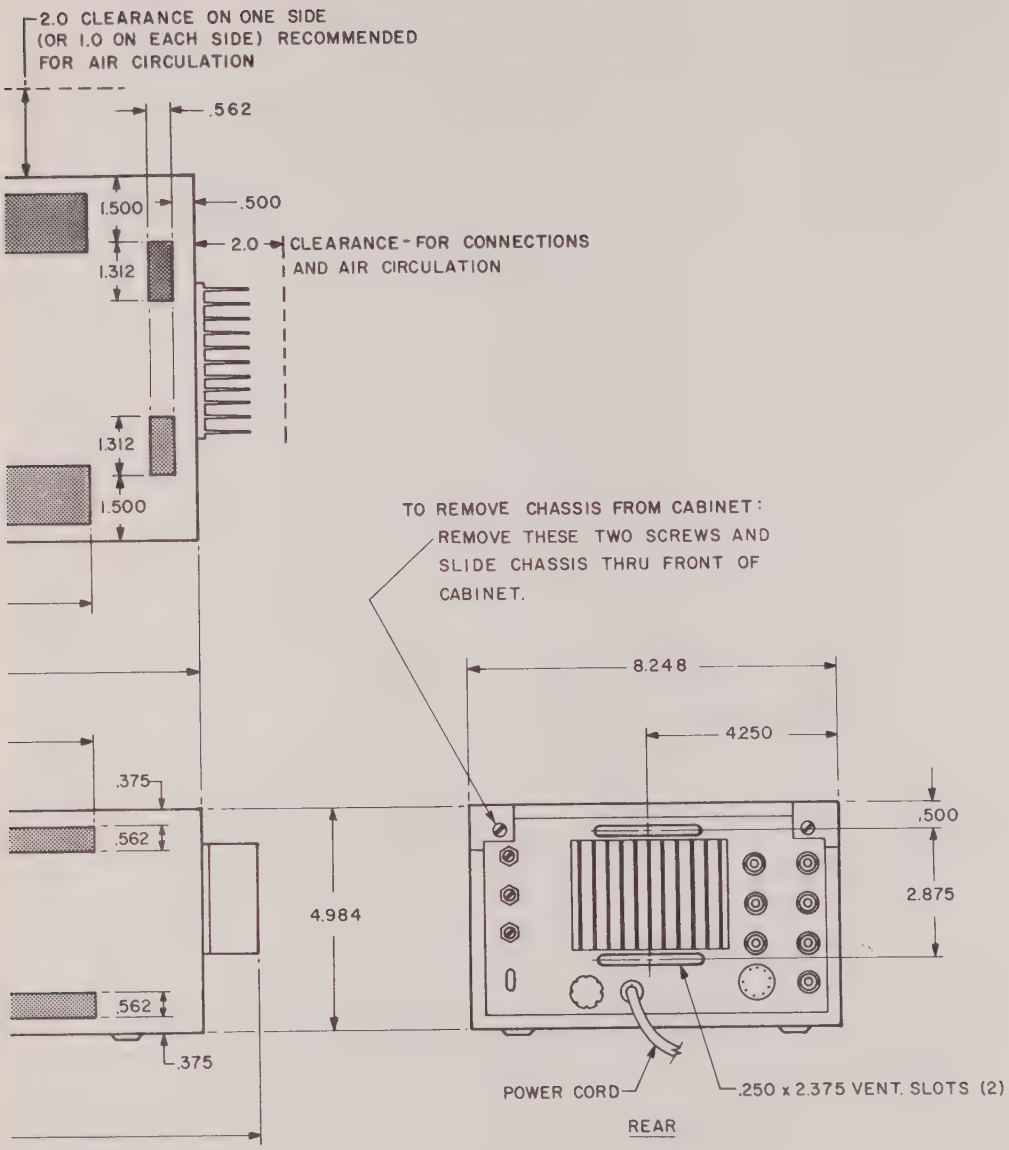
For portable use the TSM-5 can be removed from the rack or custom installation and slipped into a light gray aluminum field case. In addition, the field case is equipped with a handle and rubber feet. (See dimension drawing).

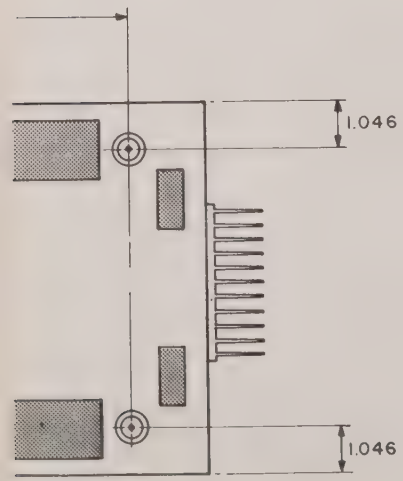
Rackmounting Option

This is a dual aluminum case which can mount two (2) TSM-5 monitors or a single TSM-5 and a blank panel. (Mounting hardware is included for the blank panel.) The dual cabinet is equipped with rack slides and rackmount brackets. The cabinet finish is brushed aluminum. (See dimension drawing.)



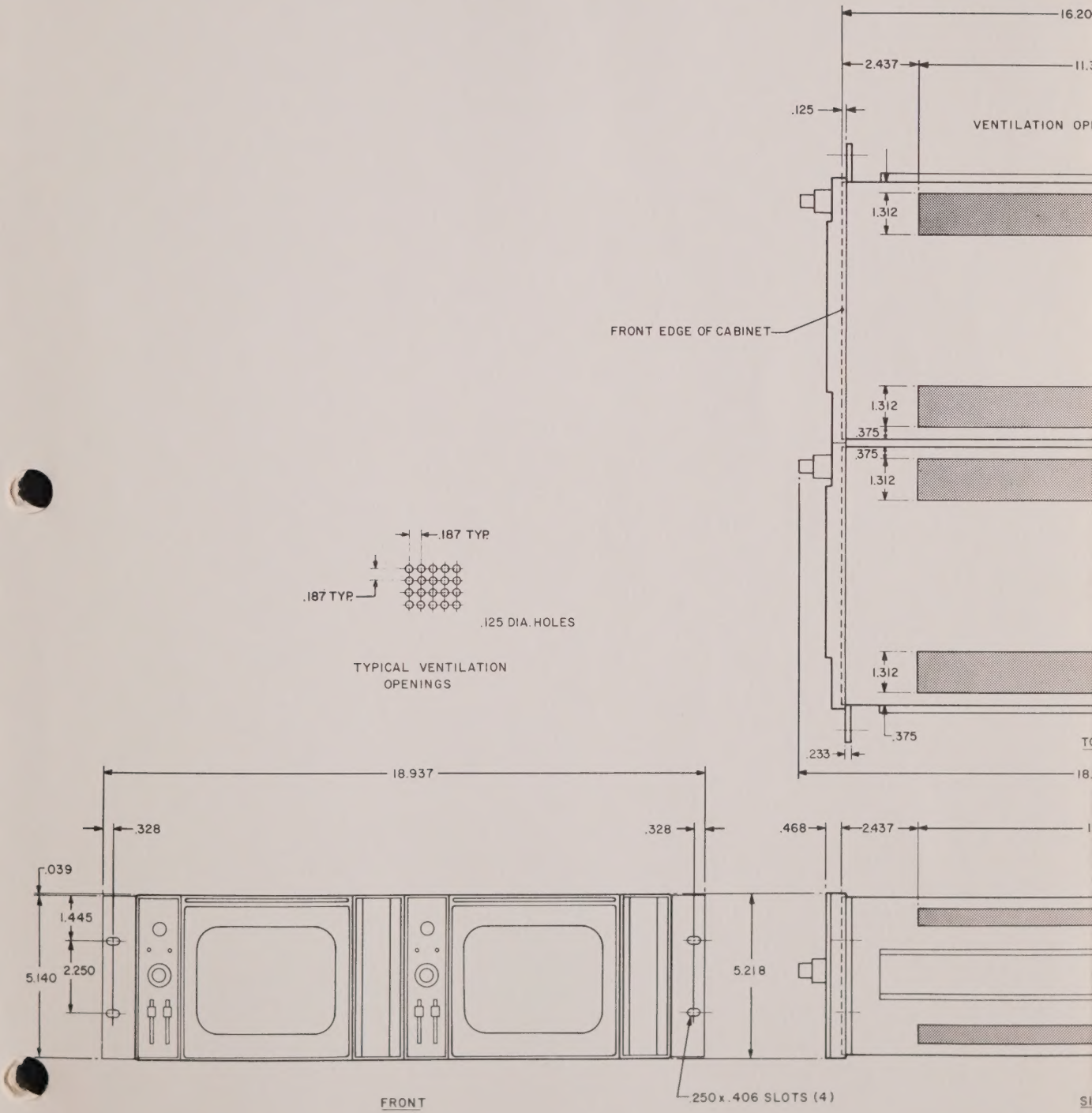
TSM-5 Portable Case Dimension Drawing

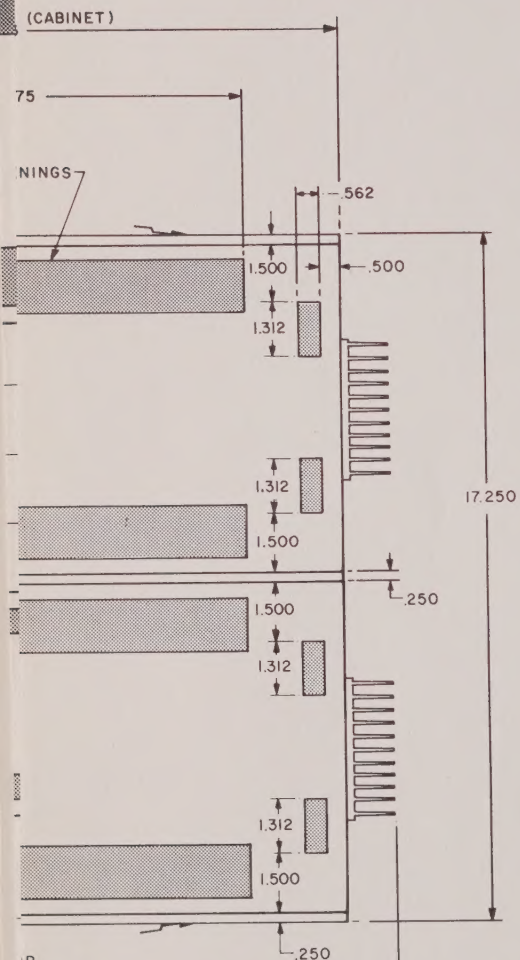




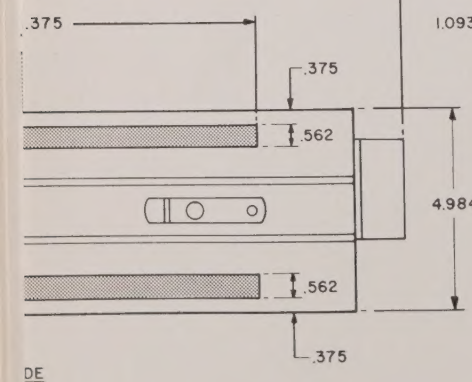
NOTES:

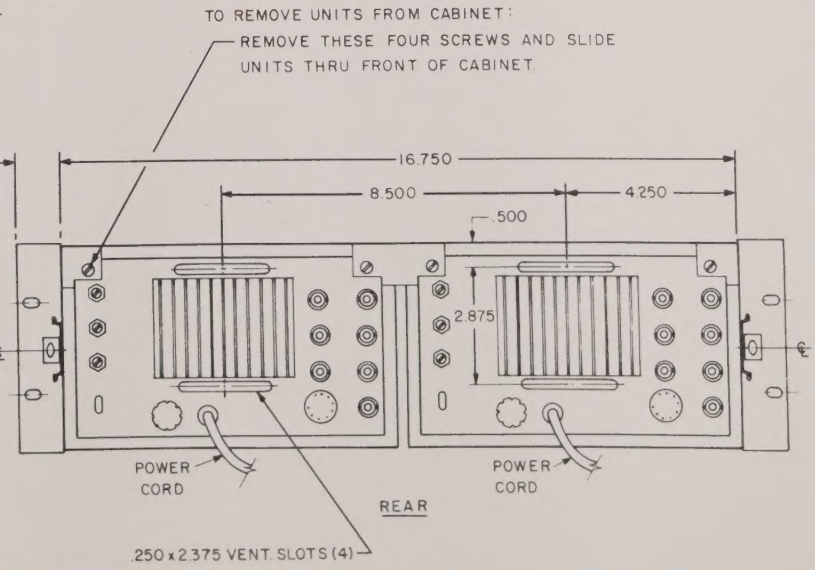
1. ALL DIMENSIONS ARE IN INCHES.
2. VENT. OPENINGS ARE THE SAME ON THE TOP AND BOTTOM PANELS.
3. VENT. OPENINGS ARE THE SAME ON THE RIGHT AND LEFT PANELS.


16.20
2.437
11.3
.125
VENTILATION OP
1.312
FRONT EDGE OF CABINET
1.312
.375
.375
1.312
.187 TYP.
.187 TYP.
.125 DIA. HOLES
TYPICAL VENTILATION
OPENINGS
1.312
.375
.233
18.937
.328
.328
.468
2.437
.039
1.445
2.250
5.140
5.218
FRONT
250 x .406 SLOTS (4)



NOTES:
1. ALL DIMENSIONS ARE IN INCHES.
2. VENTILATION OPENINGS ARE THE SAME ON THE TOP AND BOTTOM PANELS.
3. VENT. OPENINGS ARE THE SAME ON THE RIGHT AND LEFT SIDE PANELS.





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QUALITY ENDURES AT:

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